

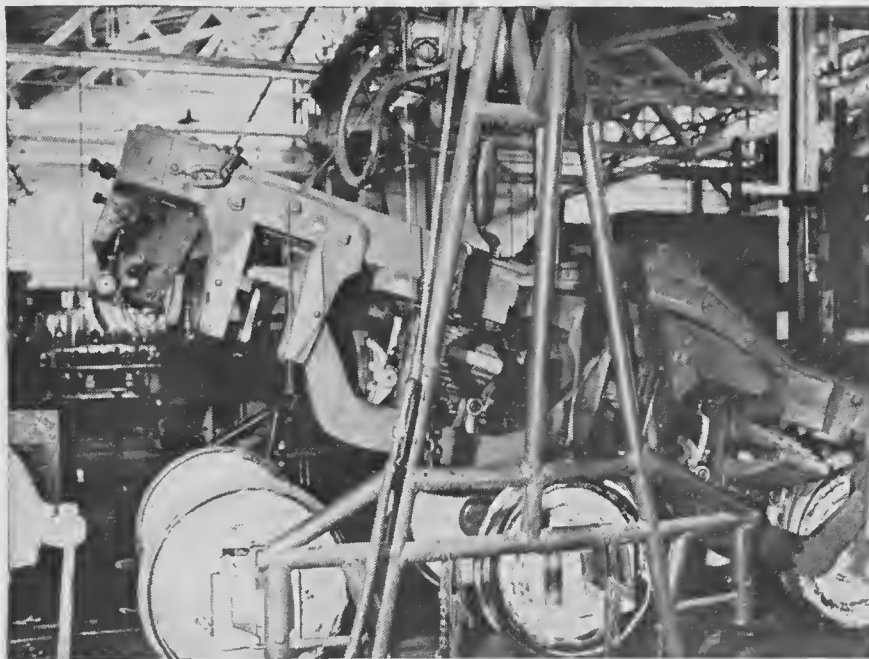


SLIDE RULE

VOL. 22 — MARCH - 1956

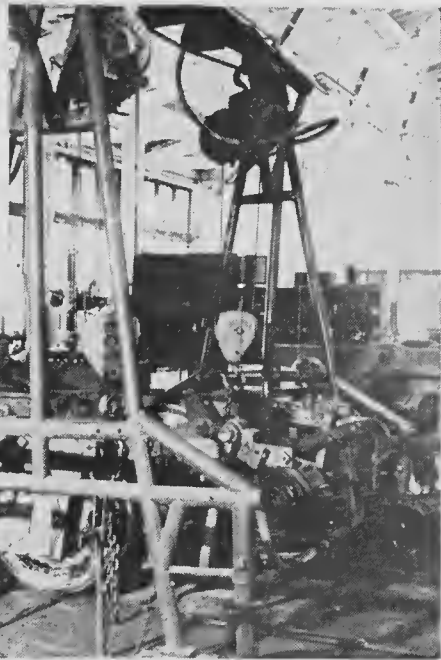
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Grad Photos

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CHRIS GILLESPIE
Grad Write-ups

FABIAN WONG
GARY THOMPSON
JACK BOHAY
LEN MORHALO
DAVE HOLLOWAY
Photography

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OUR COVER: *Building the Terrace-Kitimat line—courtesy of the Canadian National Railways.*

All correspondence and advertising copy should be addressed to the "Slide Rule," Engineering Building, University of Manitoba, Fort Garry, Manitoba. Responsibility for the contents of papers published in the "Slide Rule" rests upon the authors.

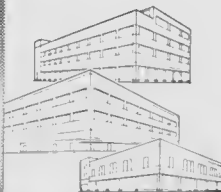
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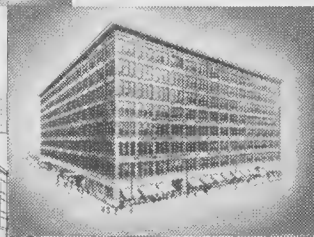
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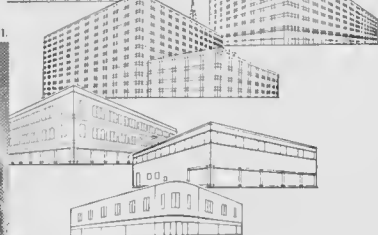
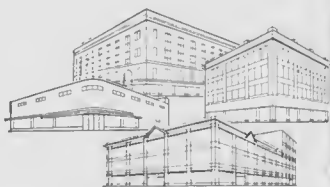
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Editor's Note

The *Slide Rule* seems to have developed into an annual publication with a two-fold purpose: to present a series of quasi-technical articles of topical interest, and to present a yearbook of student activities with special attention on the graduating class. Accordingly, the book has been divided into these two sections.

I would like to express my appreciation to Mr. T. E. Storey, Mr. Reg Hugo, Mr. Eric Thrift, Prof. G. A. Russell, Prof. C. M. Hovey, Prof. R. E. Chant, and Dean A. E. Macdonald for their kind co-operation. Many thanks are also due to Mr. Jack Skull of the Canadian National Railways through whom the four-colour plates for our cover were secured, and to Mr. Edward Judd of Shea's Winnipeg Brewery.

The publication of the *Slide Rule* would be impossible without the support of our advertisers, and we are indebted to them. Lastly, I wish to thank all those students who assisted in any way with *Slide Rule* production, and in particular, Don Gibbons and Ralph Addison for their untiring efforts.

PETE ABEL, Editor.

... magazine section

Long Range Planning —

SUPPLY AND DEMAND

By

DR. A. E. MACDONALD, B.Sc., M.Sc.,
D.Eng., M.E.I.C., P.Eng.,

Dean of the Faculty of Engineering and Architecture



DR. A. E. MACDONALD

FROM the concrete evidence at hand, there is no slackening this year in the demand for graduates in engineering. In fact, the reverse is true, and many more students than are in this year's graduating classes could be placed in interesting and remunerative positions, if they were available. It would appear that some 2,500 to 3,000 graduates per year, for some years to come, will be required from Canadian schools, whereas the potential number of graduates in 1956 is 1,700; in 1957 about 2,000; and in 1958 some 2,500. It would therefore appear that, based upon present information, several years must elapse before the supply and demand will be in approximate balance. However, even though this should come about, or the situation even reverse, the

profession holds great promise for the energetic and enthusiastic student.

The problems of providing space, equipment and teaching staff to cope with the increasing enrolment in order to meet the demand and, at the same time, keep abreast of developments in scientific progress and technology in our courses are quite a challenge. All require planning and dollars, and certainly little can be accomplished without the necessary dollars.

Since the move by the University to the Fort Garry site, long range planning has been active in the expansion of the former (Agricultural) Engineering Building, which proved inadequate even at the time of the move. The



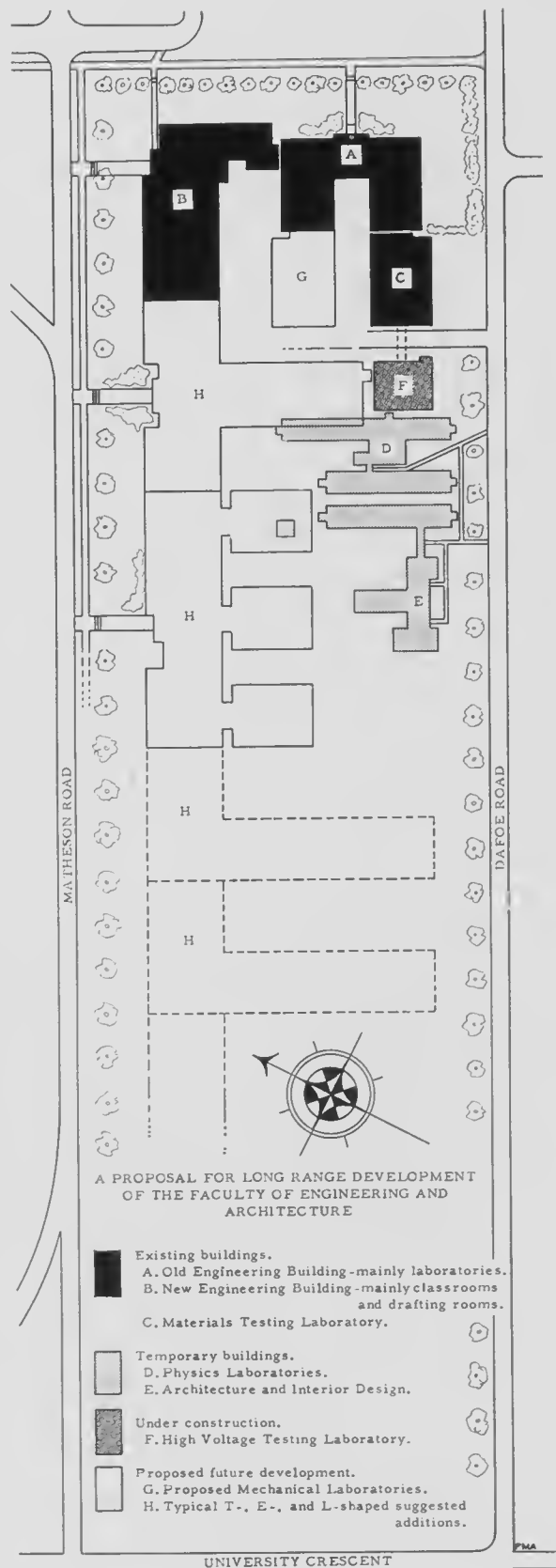
*The new High Voltage
Testing Laboratory
under construction*

problem of more and permanent space became desperate with the World War II veteran influx, and resulted in a one-storey extension to the civil engineering materials testing laboratory as well as a three-storey and basement north wing to the old building. With the industrial development of the province, the electrical engineering department had felt for some years the need of a high voltage testing laboratory in connection with problems of industrial power as well as for training students in the fundamentals.

The old Engineering Building is a right-angled U-shape in plan with the legs extending westward. The existing new materials testing laboratory extends westward from the end of the more southerly leg and was designed for two future additional storeys which will provide further laboratory floor area, some of which is now needed. By similar stages it is also planned to extend westward the existing northerly leg of the old building to match the three-storey extension to the southerly leg. The ground floor, at least, of this proposed extension is now needed.

The existing Engineering Building, which is in plan an L-shaped extension to the north and west of the old building, with the main entrance on the north side, was designed with all corridors dead-ended at the west wall to provide for further expansion in a westerly direction. T-shaped units, or L-shaped units opposite hand to that of the new building, can be added as the need arises. Development of this westerly expansion would give a building plan in the shape of a multiple E, the wings to the south providing necessary future laboratory or other floor space. Experience seems to prove that sights are rarely raised high enough in planning future expansions, so it is sincerely hoped that the area bounded by Matheson Road on the north, Dafoe Road on the south, and University Crescent on the west, will be reserved for this future building project—in which the School of Architecture is invited to locate. It would mean that the great majority of activities could be carried on under the one roof and there would be little need of racing for classes between buildings in below zero weather as our usual southern latitude university layouts require.

Current construction for electrical engineering is the new High Voltage Testing Laboratory going up to the west of and across the lane from the west end of the new civil engineering materials testing laboratory. It's location is planned to connect with the south wing of the next future T-, L-, or E-shaped extension to the new Engineering Building.



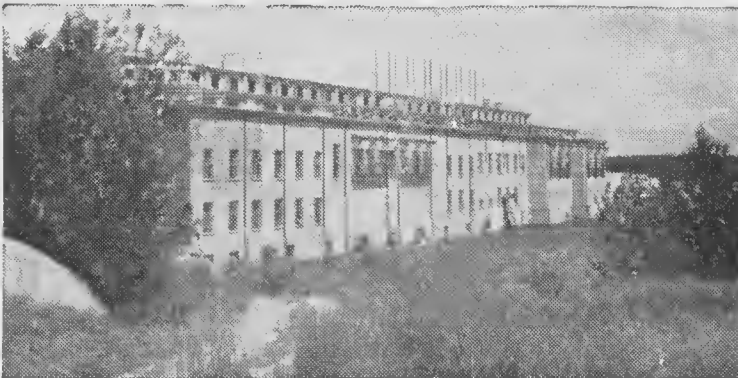
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This High Voltage Testing Laboratory will have a frontage of approximately 60 feet on the south side at Dafoe Road and extend north approximately 64 feet. It will provide both a high voltage testing area as well as accommodation for a sub-laboratory of the Canadian Standards Association. The former will occupy, on the west side, a clear open space some 37 feet east-to-west by 60 feet north-to-south by 38 feet high, with a large roll-up entrance door, on the south side at Dafoe Road, providing an opening some 22 feet high by 16 feet wide for the accommodation of large test equipment. The sub-laboratory will occupy, on two floors under a total roof height of approximately 25 feet, most of the remaining space on the east side of the building. On the second floor there will be an observation gallery overlooking the high voltage area. This High Voltage Testing Laboratory will serve both industrial needs as well as educational purposes. Its capacity will be approximately 2,500 kilovolts.

These, then, are our present realities and dreams and with the passage of time and as the needs become urgent we hope our dreams become realities. Our national welfare and safety depend upon it. As graduates, you can help with constructive criticisms and advice as well as with financial support.



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The Engineer and Public Utilities

By

T. E. STOREY,
B.Sc. (E.E.) (Man.), M.E.I.C., P.Eng.,
General Manager
City of Winnipeg Hydro Electric System
Honorary President
University of Manitoba Engineering Society



T. E. STOREY

IN discussing the role of the engineer in public utilities, it is necessary to define both the term "engineer" and also to specify what is intended by the expression "a public utility." An engineer is intended to be a university graduate who is a qualified professional engineer, or a graduate who lacks only the years of experience necessary for him to be registered as a professional engineer. In using the expression "a public utility," I have in mind an organization whose purpose is to supply a necessary service or commodity to the general public without any reference to ownership either by private capital or a public or government body. Such public utilities would include railways, transit systems, telegraph and telephone systems, water and sewer services, gas companies, electrical power suppliers, district heating suppliers and street lighting organizations, etc.

In all these public utilities there is a wide field of opportunity for the engineer, in fact all of them depend largely on engineers and engineering skills for their successful development and operation. These organizations vary not only in the type of service rendered and in the type of ownership, but also in size.

I have chosen to discuss this field of endeavor for engineers not only because it is the one I am most familiar with, but because the opportunities offered to engineers

are often less readily recognized than is the case in such activities as construction, manufacturing and research.

In any large organization of any kind there is of necessity a good deal of specialization of the engineering work but even in the case of the largest public utilities this specialization is less restrictive than is the case in many types of manufacturing or construction.

Public utilities generally involve all phases of engineering to some degree from planning, promoting, developing, constructing, operating, and maintaining to selling. In most cases and to varying degrees the general classifications of engineering required are civil, electrical and mechanical.

The civil engineer is required to handle surveying, site development, structural design, construction, alterations and maintenance, floor loadings, building and equipment foundations, water supply, drainage, etc., and in some cases the supply of a commodity as in a water supply system.

The electrical engineer is required for lighting, power for services,—installation, operation and maintenance of equipment, communications, supply of product or service, etc.

The mechanical engineer is required for heating and ventilating,—installation, opera-



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tion and maintenance of equipment, supply of product or service, etc.

The men in all three classifications of engineering are required to work closely with each other and are required to co-ordinate all stages of their work with each other.

In medium and small-sized utilities the opportunity for a wide variety of experience is available to a larger extent than is usually the case either in very large utilities or in other fields of engineering activity. In these smaller utilities the amount of any specific type of work is limited, with the result that there is usually a small group of civil, electrical and mechanical engineers with each individual handling several or all the various phases of his particular branch of engineering, to the degree his experience justifies, and with some overlapping into the other branches of the profession on many projects. This opportunity to work intimately with the engineers in the other branches of the profession is not usually available in larger organizations where plans are made and developed in highly departmentalized offices with the necessary co-ordination done at a fairly senior level. In the smaller groups the project becomes a family or group development with each person making his contribution to the whole project and benefiting directly from the knowledge and experience of the others.

This broad experience is particularly valuable to recent graduates in enabling each individual to find the type of work he is best suited for and the type of endeavor he will enjoy most. In many cases the opportunity to gain a wide and varied experience provides the necessary knowledge to permit the engineer to progress into a senior engineering or administrative position.

Many engineering activities are largely confined to small technical groups or may even be confined to one person. Young engineers should take advantage of every opportunity to broaden their outlook and approach to any problem. The experience gained in public utility work is of value in encouraging team work not only with other engineers but with all types of workers to a much greater extent than is possible in many other lines of engineering endeavor.

Professional engineers as a group comprise people with different abilities and varying likes and dislikes with respect to the types of work available, and it should be noted that few organizations can exceed the variety of opportunity that can be found for the engineer in public utility work.

As in all types of endeavor there are some aspects of public utility work that

would not suit some individuals. As a public utility is usually supplying a commodity or service necessary for the welfare and convenience of the general public, it is usually a twenty-four-hour-a-day service, and, as such, a cardinal requirement of good service is its continual availability. It naturally follows that an engineer in a public utility may be subject to call at any hour when an emergency interruption to service may occur, he may be required to work long and irregular hours, make prompt decisions, provide leadership, improvise temporary solutions to problems pending final decisions or using available materials or equipment. For those engineers who want a steady routine, regular hours, time for consideration and investigation before making decisions, etc., perhaps some form of research or manufacturing is desirable. Others may prefer teaching, others may like the excitement and variety of location provided by construction work, but for those interested in variety of work, a broad engineering experience and the satisfaction of helping to provide a needed service to a large number of the public, the public utilities offer many opportunities and should not be overlooked as a field for employment.

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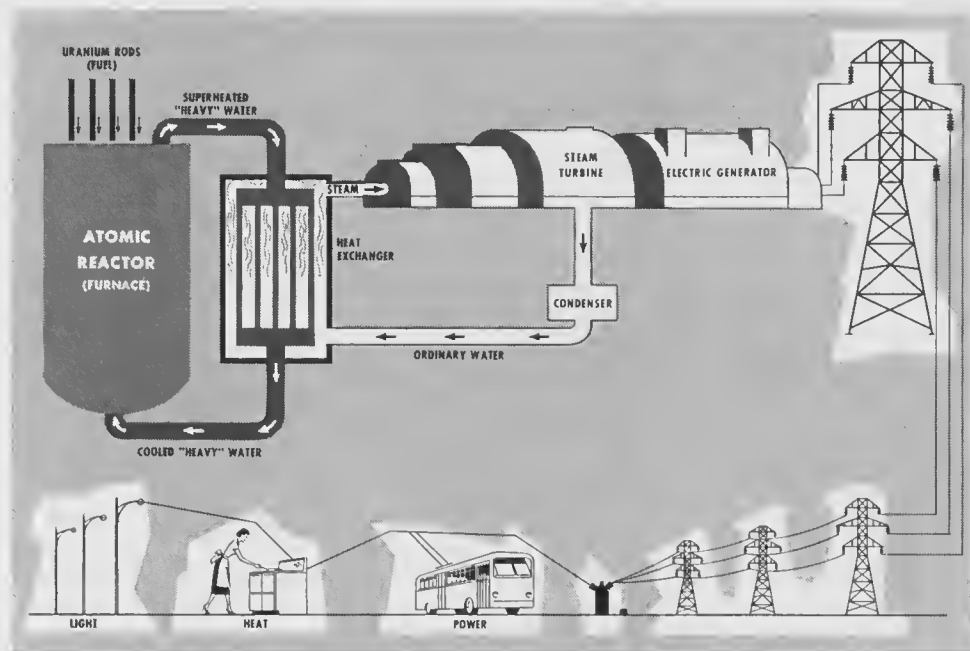
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DRAMATIC proof of Canada's world prominence in the development of nuclear energy for industrial purposes is the atomic electric power plant now being designed for erection near Chalk River, Ontario.

Basically, the plant will consist of an atomic reactor and an electric generator driven by a steam turbine. The vast heat from the reactor, or furnace, creates the steam to drive the turbine. This unique power plant when completed, will become part of the Ontario Hydro system.

Electricity from the atomic power plant will be exactly the same as the electric power we know today. Only the source of energy to produce the steam is changed.

For this complex and challenging assignment a new organization has been formed within Canadian General Electric . . . the Civilian Atomic Power Department. Already a

group of highly qualified people, including top nuclear experts, is working full-time on the project.

Canadian General Electric is deeply conscious of its great responsibilities in pioneering this new and vital development. The invaluable knowledge and experience gained from all phases of the work will be freely available to privately and publicly owned power companies across Canada. It will be a working pilot plant on which to base the atomic electric stations of tomorrow.

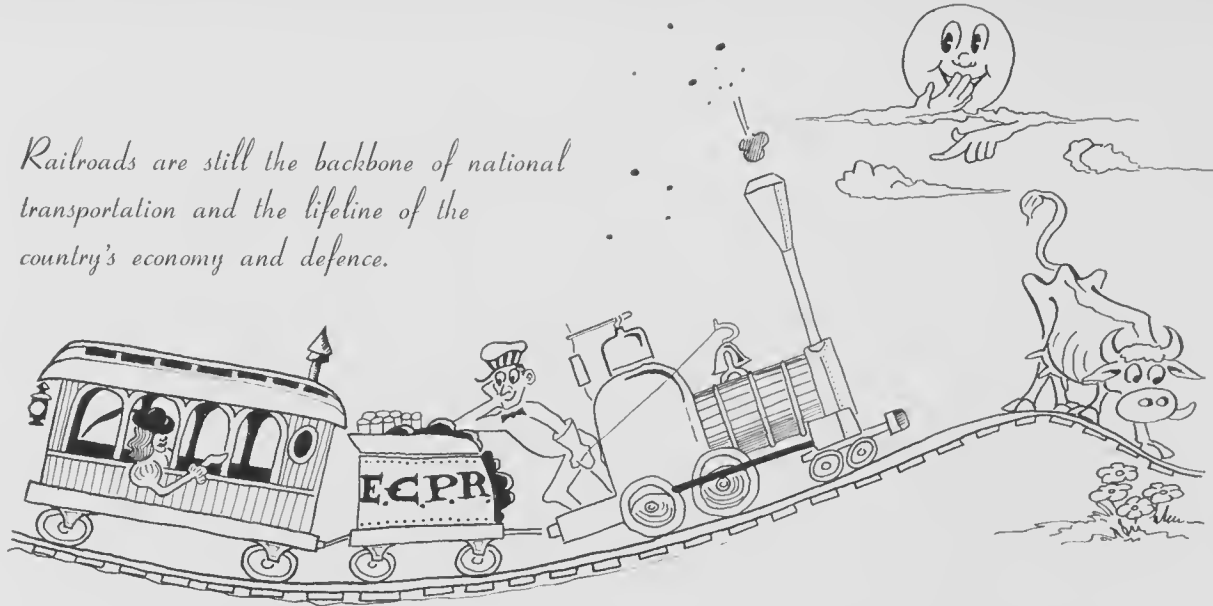
For over 60 years, Canadian General Electric has helped to spread the benefits of electric power throughout this country—building equipment to generate power, transmit it and put it to work. It is gratifying to have this historic opportunity to contribute both experience and a share of the cost to a development that will still further promote the electrical way of living for all Canadians.



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Railroads are still the backbone of national transportation and the lifeline of the country's economy and defence.



THE IRON HORSE IS STILL KICKING

By JACK SKULL AND DON MACDONALD

RAILROADING started in Canada in 1836, when the Champlain and St. Lawrence Railway (now part of the C.N.R.) began operation between Laprairie and St. John, Que. From that small beginning, it has grown to be the nation's backbone and lifeline in one. Today our railways affect the lives of every Canadian, whether he lives in a "rail-road town" or a thousand miles from the nearest track.

Because of the enormous size of Canada, and the development and industrial expansion which is taking place and certain to continue in the years ahead, the future of the railways is as bright as its past is romantic. This achievement is not likely to happen without continued progress in methods of operation, and the railways are counting heavily on the engineering profession to produce the technological advances, thereby making the best use of human and material resources.

Donald Gordon, chairman and president of the C.N.R., once said:

"In the course of a day, while grappling with my work, I find that being president of a railway such as this also means that I must be, in unequal parts, a real estate broker, an engineer, a caterer, an economist, a chemist, a motion picture producer, an electrician, a lawyer, mechanic, publicist, an aviation specialist, bridge builder, medical man, foreign trade expert, a hotel manager and, on occasion, a lay father confessor and always a philosopher."

That Mr. Gordon has to be so many things at the same time is a result of the renewed vigour with which the railway is dealing with its problems and extending the bounds of its already diverse operations.

The railways of North America, as early as 1867, began the standardization of equipment, so that today all major rail lines on the continent can operate as though they were one operational system.

The fact that the motive power is separate from the carrying units gives the railroad another advantage. They can adapt to any type of prime mover. Railways began with steam, and early made use of electric power; they have now adopted the diesel locomotive, and have already begun to use gas turbines. One American railway recently joined forces with a locomotive builder to help develop a nuclear-powered locomotive.

New types of locomotives are only one part of a technological revolution that has taken place on the railways. Track maintenance has become more mechanized, and today the major part of track ballasting, renewing of ties and rails, and the laying of new track is done with machines.

Chemical treatment of ties has increased the average life from about eight to 25 years; improvements in rails have greatly extended their life, and reduced the risk of breakage, resulting in the more efficient use of steel.



*Signal
Inspection*

Centralized Traffic Control, known as CTC, has increased the efficiency of train operations to where a single track can handle about the same amount of traffic as formerly handled on double track. Radio communications in switching and train operations have been under test for some time. New types of cars have been developed for handling specialized traffic and heavier cars than ever before are now in use for handling very heavy loads.

Many of these improvements have resulted from research carried on by the railroads themselves. That this type of research will continue to develop new methods and better materials is clearly indicated by the recent appointment of Dr. O. M. Solandt, one of Canada's best known and most respected scientists, to the C.N.R. as assistant vice-president of research and development.

The C.N.R. already has an impressive list of new developments to its credit. Chief

among these is the newly-designed automobile car, which is expected to reduce costs in the handling of long-haul automobile traffic. Another important development from the C.N.R. laboratories was the "Canex," a container for fresh fish, which makes it possible to transport fish from the Maritimes or West Coast to distant markets with no deterioration in quality.

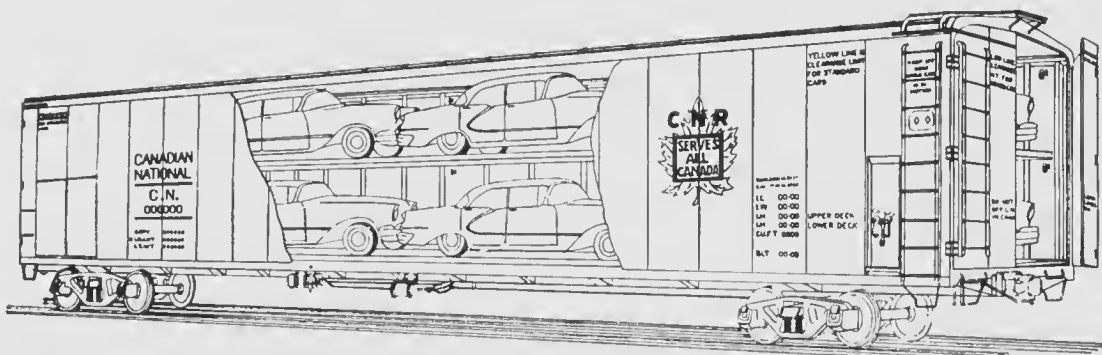
The C.N.R.'s research laboratories also developed a method of heat-treating coil springs on box cars. Now being introduced in the manufacturing process, it is estimated to bring about operational economies of up to \$100,000 per year.

Highway trailers carried on flat cars, or "piggy back," were introduced on Canadian railroads in 1952. When constant two-way traffic is available, "piggy back" operation combines the railway's advantages of cheap long-distance hauling with the truck's advantage of point-to-point pickup and delivery.

Changes no less revolutionary have occurred in passenger trains and equipment. New types of cars, such as the dinette—essentially a lunch counter on wheels—have added service while reducing costs to the passenger.

The railways now make better use than ever before of glass, plastics, new steels and aluminum, better upholstery materials, and better car construction to improve the comfort and safety of train travellers. And, at the same time, with the introduction of new transcontinental trains last year, they have cut travelling time far below what was thought possible a short time ago.

In the development of new equipment they have made use of many engineering skills. New types of spring suspension have reduced sway; improved paints have cut maintenance costs; air conditioning and temperature controls have been perfected to the point where every passenger in enclosed



NEW RAIL CAR — The first car of its type to be introduced in the railway industry in North America, a double-deck automobile transporter, will be placed in service by the Canadian National Railways this spring. The unique car, illustrated in the artist's sketch above, will be the largest freight unit in C.N.R. operation and will increase the capacity of present railway automobile cars from four to eight vehicles.

sleeping space can have the climate he wants, without causing discomfort to his neighbor. The C.N.R. refers to modern travel as "travel living," and the description is readily applicable to our modern trains.

As in all business, cost is of prime importance to the railroads. With their inherent advantages, railways should be able to meet any competition offered, and railwaymen say they could if it were merely a question of competition. But other questions enter into it. For example, the railways in Canada have always been considered as of prime importance in developing the country. Without cheap transportation for bulk goods, many areas in Canada would still be frontier or completely empty. The railways still carry on this function.

All basic commodities such as grain, forest products, coal and iron ore, gravel and similar traffic move at rates far below that charged for high-rated goods in which the transportation costs are but a fraction of the total. It is this high-rated traffic, which traditionally has helped railways to cover the cost of hauling the bulk traffic, that the railways' competitors have found a lucrative field.

Because of present regulations covering the operations of the railways, they have not been able to meet these competitors on their own grounds. Truckers, with the few exceptions where the Provincial authorities prescribe and enforce highway rates, can quote any rate they wish to any shipper, or even change rates on the spot to meet competition. Not so the railways. They must publish all rates, and apply the same rates, without discrimination, to all those shipping goods under the specified conditions. As a result of the handicaps these regulations impose on the railways, trucks in Canada annually haul only about 10 per cent of the traffic, but earn about 25 per cent of all transportation revenues.

But despite these restrictions and regulations, the railways never stop building. Since 1947 the railroads of Canada have spent well in excess of one billion dollars in net additions and improvements to their properties. During the past five years, they have added, or are adding, about 600 miles of new railway lines.

Most active has been the C.N.R. which, in 1953, after two years of intensive effort, completed its line from Sherridon to Lynn Lake, Man., a distance of 144 miles, to open up a rich new source of base-metal wealth. To build the line, more than 2,000 acres of land had to be cleared. The turbulent Churchill River was spanned with three steel bridges, and 53 other bridges were laid across numerous lakes and rivers.



Construction survey party

Last year, the C.N.R. placed in operation its line from Terrace to Kitimat, to serve the fast-growing aluminum colossus in British Columbia. Built at a cost of more than \$10,000,000, the 43-mile branch was pushed through some of the most rugged territory in Canada, and took two years to complete. It required the construction of a 1,081-foot steel bridge across the Skeena River, and four smaller bridges totalling 700 feet. Some 2,300,000 cubic yards of rock, sand and gravel were moved to provide the right-of-way.

To serve the fabulous Geco Mines at Manitouwadge, Ont., two spur lines were completed in 1955, connecting the development with the two transcontinental railways. In addition, a 60-mile railway was rebuilt to transport iron ore from a new open pit mine at Marmora, Ont., to dockside at Picton.

In 1953, preliminary surveys began on the 292-mile long line from Beattyville to St. Felicien, through Chibougamau, in Northern Quebec. This extension will connect with the C.N.R.'s Barraute-Beattyville line and the Quebec City-Lake St. John line, and will open up a vast forest and mineral area.

A two-span, 400-foot cantilever bridge over the fast-flowing Bell River, 11 miles north of Beattyville, has already been erected. Before construction could begin, special equipment had to be trekked into the area, including a needlemast, dismantled to get it through rugged bush country to the Bell River. A catwalk had to be provided to give workmen a means of getting from shore to shore, and life preservers had to be laid across the channel as a safety measure. A



Bridge construction on the Beattyville-Chibougamau line

cable-way was extended from the needlemast on the north shore to an A-frame on the south side of the river and every piece of steel for the bridge was jockeyed into position by running it along the high-line.

Ore deposits already discovered in this area total more than 10,000,000 tons, and forest growth adjacent to the line is estimated at 12,000,000 cords.

Construction on the Beattyville-Chibougamau section is well under way and its completion is expected by the end of this

year, and contracts for the building of the Chibougamau-St. Felicien section have been awarded.

Other important railway construction includes the new Queen Elizabeth Hotel, part of the C.N.R.'s terminal development in Montreal. This largest and most modern hotel in the British Commonwealth is also by far the largest building in Canada to be built with a welded frame. Electric welding replaced rivetting in all but a few small trusses. The steel frame has already been finished and more than 17,000,000 pounds of structural steel was used in the huge building.

Because of the diversity of their operations and the growing complexity of methods, organization and equipment, the railroads of Canada offer a wide range of careers for trained men. In the past, railways have encouraged men to face the challenge of geographic frontiers. Today, they are looking for men who are excited by the challenge of the technological frontier.

Yes, the Iron Horse is still kicking, and, although his outward appearance has changed, he is still much the same horse, doing his traditional job of nation building.



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Specialist Versus General Practitioner

By PROF. G. A. RUSSELL, E.M.(Geol.) (Minn.), M.Sc.(Queen's), P.Eng.,
Chairman of the Committee for Geological Engineering

WITH a title like the one I am writing under, the first thing people who are not thinking would be liable to ask is: What is an article about medicine doing in an engineering publication? The reason I know that people who would ask such a question are not thinking is because, at Manitoba anyway, engineers take a very dim view of medics and it is highly unlikely that contributions would be solicited from such a source. By the word *specialist* I mean any person who devotes the major portion of his vocational endeavours to a limited field—for example, an electrical engineer who specializes in the design of the third prong on a radio tube. By the term *general practitioner* I mean any person who devotes the major portion of his vocational endeavours to a broad field, or even to the correlation of data from several fields—for example, the mining engineer who, it has been claimed, is required to be familiar with everything from obstetrics to embalming. Now that we've mentioned the mining engineer we can get down to the case at point.

The Gordon Royal Commission on the Economic Development of Canada, which recently held hearings in Winnipeg, was presented with a brief to the effect that the country in general and the University of Manitoba in particular are not turning out enough mining engineers for the industry. There is an excellent chance that much more information was contained in the brief than was presented in the press releases but, since the newspapers are and will be read by a great many more people than will ever read the brief presented or the Royal Commission reports, it will be well to analyze the press report, i.e., that there are not enough mining engineers graduating. Before this is done, though, it will be well to introduce a paragraph on the demand for engineers in general, and this paragraph should begin with some attempt at defining the word *engineer*, at least as far as this word applies to university

graduates—not to the operators of steam and diesel locomotives.

My definition of an engineer is as follows: *An engineer is a person who is trained to employ his reason and creative ability to make the most efficient use of materials and TIME.* In the busy pace of the twentieth century we see that an engineer, as defined above, is an extremely important individual but, I hasten to add, not necessarily *the* most important individual. For example, it doesn't seem to be much of an accomplishment to design and build a super-highway if the general public becomes so alcoholic that it is unable to stay on the highway. This example is given because if a person fails to "keep his feet on the ground," when he reads some of the hysterical press releases about the all-pervading demand for scientists and engineers, he is liable to get the idea that science and engineering are the two most important things in the world today. No doubt there are some who believe this to be true, but I venture the suggestion that our entire social structure could collapse around their ears without them ever knowing what hit them. In spite of this, the glittering phrases continue to appear and while it would be impossible, without an extensive amount of research, to analyze these statements as to the amount of truth they may contain, we can, at least, look at the one close to home—the one presented before the Royal Commission in Winnipeg concerning the shortage of mining engineers.

First of all, what do we mean by the term *mining engineer*? This can be stated by modifying suitably my general definition of an engineer as follows: *A mining engineer is a person who is trained to employ his reason and creative ability to make the most efficient use of materials and time in the problems associated with the extraction of ore from the ground.* Following this definition of the term, we should return momentarily to our title and ask: Is the mining engineer a specialist

or is he a general practitioner? The answer to this question will determine whether the accusation made before the Royal Commission is true or false.

I believe the mining engineer is a general practitioner—not a specialist. My belief is based on the following:

1. Four years of technical training in a recognized faculty of mining engineering.
2. Twelve years of education in underground mining with four different companies, two in the United States and two in Canada.

Let's look for a minute at the responsibilities of a mining engineer—at the kinds of knowledge he has to have—at the kinds of jobs he has to do.

The mining engineer must "be" a civil engineer because, being boss over the whole project, he is responsible for surface construction, such as headframes, buildings, roads, water supply and sewage disposal. Knowledge of the civil engineer is also required in the design of support structures underground and, as far as I am concerned, a loaded concrete beam is a loaded concrete beam regardless of whether it is supporting the floor of a building on surface or a load of loose rock underground—i.e., the beam doesn't deflect differently just because it is underground.

The mining engineer must "be" a mechanical engineer because nearly every operation in his project is mechanized. This doesn't mean that he must be able to operate every piece of equipment, but he must have enough knowledge of the principles of machinery design and construction to know what the machine "can do" and then see that maximum effort is obtained. In other words, he must be "one jump ahead" of the machine operators.

The mining engineer must "be" an electrical engineer to the extent that all of his equipment, except at small properties in

remote areas, is basically activated by electric power. Here, too, for the most efficient use of materials and time, he should be "one jump ahead" of operating personnel.

In addition to the above more or less technical responsibilities, the mining engineer has duties in the field of human relations. He is the official liaison between capital and labour. He requires solid qualities of executive ability in order to fuse the efforts of a group of individuals, possessing widely divergent skills, into a smoothly running operation.

Yes—I thought you might be wondering about that. You are asking: Doesn't a mining engineer have to know anything about mining? My answer is that he certainly does but he will learn very little about mining in either the classroom or the laboratory. Not until he gets underground and acquires, by personal experience, knowledge of the three-dimensional operation called mining can he understand what is going on, let alone become proficient as a *mining* engineer. In school he can learn a lot of terms and study diagrams of different mining methods and learn about the types of machinery that are employed but to say one can learn about mining in school is the same as saying that one can learn to play football by watching a game on TV.

Well—what does it all boil down to? It boils down to this: Any person who has received a solid course of instruction in the fundamental principles of mathematics, physics, chemistry, surveying, strength of materials and hydraulics—plus the application of these principles to the design, construction and operation of electrical and mechanical equipment,—plus some geological knowledge of earth materials, structural geology and the nature of ore deposits, should qualify as a good embryo mining engineer. As far as his mining knowledge is concerned, his education can have but a bare beginning until he actually gets out on the job. As far

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as his training in problems involving human relations is concerned, most engineering faculties today are trying to assist the student engineer by the introduction of courses in philosophy, history, psychology, and—believe it or not—in one engineering school, courses in the appreciation of art and music.

I think that the statement to the effect that there are not enough mining engineers must be re-stated as follows: There are not enough engineers interested in going into the mining industry. The reasons for this are, I believe, not to be found in the course content of any curriculum or in the vocational guidance groups that have been set up. I think there are two reasons why engineers are not interested in going into mining.

First, if the performance around the University of Manitoba Employment Service (and the campus in general) can be taken as an indication, the mining industry is completely apathetic as to whether any engineers head for the mines or not. Beginning in November, the campus is besieged by representatives of many industrial corporations and, for several years now, by representatives of all major oil companies that are operating in Canada. These amiable people have application blanks, illustrated brochures, moving pictures showing the work and general life of their employees and, most important of all,

ready answers to the students' questions. The mining companies, here at the University of Manitoba at least, present a sorry contrast to this practice. This is extremely unfortunate because it is the mining companies who should be most alert in publicizing the attractions of careers in the mineral industry. This is true because of the second reason which I believe is responsible for the failure of engineers to enter the mineral industry.

The second reason why I believe more engineers are not interested in mining is because in our modern "high standard of living" world, there is a distinct gravitation of people toward the bright lights, comforts and, I believe very important, the anonymous nature of life in a city as compared to the lack of privacy which prevails in many of our smaller mining communities. It is doubtful whether much can be done about the problem which is the basis for this second reason. One can say: Go west, young man, go west, or go north, young man, go north, but—and pardon the use of another old saying—you can lead a horse to water but you can't make him drink. The important point about both reasons given here is that the mining companies seem to be unaware that such reasons exist at all or that the mineral industry is being effectively *out-talked* by a lot of suave, smooth-speaking gentlemen from the

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personnel departments of large, city-based, industrial corporations who have modern social trends solidly behind them. I think that some mining companies are still living in the past—in the days of the “dirty thirties”—when the mineral industry of Canada absorbed more graduate engineers—civil, mechanical and electrical, as well as mining—than any other industry in Canada. I sincerely regret the apparent apathy of the mineral industry to “blow its own horn a little” and bring to the attention of engineering students some of the attractions of a career in mining. Young people today have a certain amount of inertia, as most of us have experienced, and it is difficult to see why they would devote any considerable amount of energy to trying to find out about one career when a half-a-dozen or so other careers are, literally, handed to them on a silver platter.

Some person has defined a specialist as one who learns more and more about less and less until eventually he knows everything about nothing. On the other hand, general practitioners have sometimes been accused—chiefly by specialists—of being jacks of all trades and masters of none. In spite of human fancy which, according to history, swings violently in one direction and then just as violently in the other, it appears certain that our present

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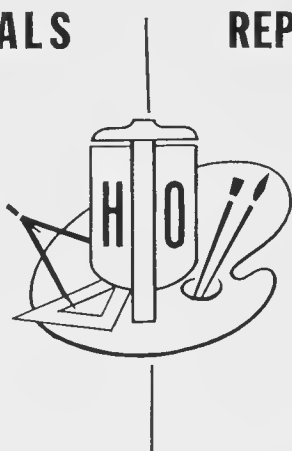
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social and economic structure needs both specialists and general practitioners, humanitarians as well as scientists and engineers. It must certainly be a personal matter for the individual student engineer to decide whether his career—for either monetary or intellectual reasons—lies in some field of specialization or in a field of broader aspects or even in more than one field.

Since I was instructed, when asked to contribute to the *Slide Rule*, not to give any advice to the students, nothing contained in this article should be construed as implying advice. I wish you every success in your professional careers, regardless of where the path may lead.

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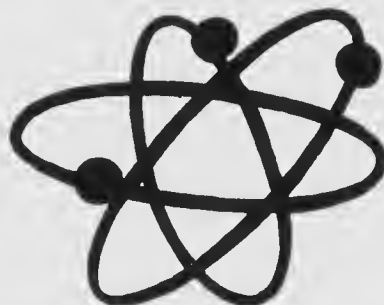
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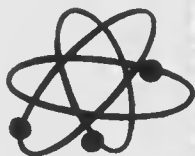
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PROBLEMS IN PLANNING NEW DEVELOPMENT

By

ERIC W. THRIFT

Director

Metropolitan Planning Commission of Greater Winnipeg

THE widespread new development of raw land around many Canadian cities has created problems which call for the attention of all those people in technical fields related to land development and its servicing. To illustrate how a town planner's work relates to other technical considerations, it seemed to me that a description of the work done on a large development scheme in the Greater Winnipeg area would serve this purpose most effectively. This short discussion will therefore deal with the planning of Windsor Park, in the south part of the City of St. Boniface.

In the first place it was necessary to decide if the area proposed for this development was suitable for residential development. Such questions arose as these:

1. Was the land suitable for building houses upon?
2. Was the site reasonably accessible from downtown or industrial areas where people who lived in this district might expect to find jobs?
3. Are there likely to be adequate thoroughfare routes leading to other parts of Greater Winnipeg?
4. Would it be practicable to provide adequate transit service to the area if it became fully developed with houses?
5. Could adequate space be provided for commercial facilities, stores and other similar retail outlets required by the community?
6. Could space and financing for schools be found, so that children would have adequate educational facilities?
7. Would there be adequate space provided for parks and playgrounds?
8. What is the capacity of the basic utility lines which might be extended to serve the area?
9. Were such basic utility lines sufficiently accessible to make the development economically feasible? These include water, sewer and power.

Over all these individual considerations was the integration of the scheme with the overall pattern of land use development in the Metropolitan area. That means, was it reasonable and suitable to develop this land for residential purposes now, and would it relate properly to the other basic land uses such as, industry and commerce. Essentially, it meant that this would have to be a suitable area for a large addition to housing accommodation in Greater Winnipeg.

It is clear from this that the economic feasibility of such a development had to be explored at least in a general way before detailed work could proceed, and before a good deal of money was spent on involved and complicated design of street or utility systems.

After initial studies indicated that this development appeared to be a reasonable and practical one, it was then necessary to work out a basic land use scheme for the whole area. While this was presumably to be entirely a residential development, the whole area covered with houses would have many deficiencies in it. In order to be a really good residential area there would have to be school sites, park and playground areas, some shopping facilities, places for churches and so on, and so the problem was one of determining in a general way where all of the various uses, besides that of housing, could be located most effectively. At this stage, of course, the land use scheme is only in sketch form and the location of the general use areas is still in a rather fluid state.

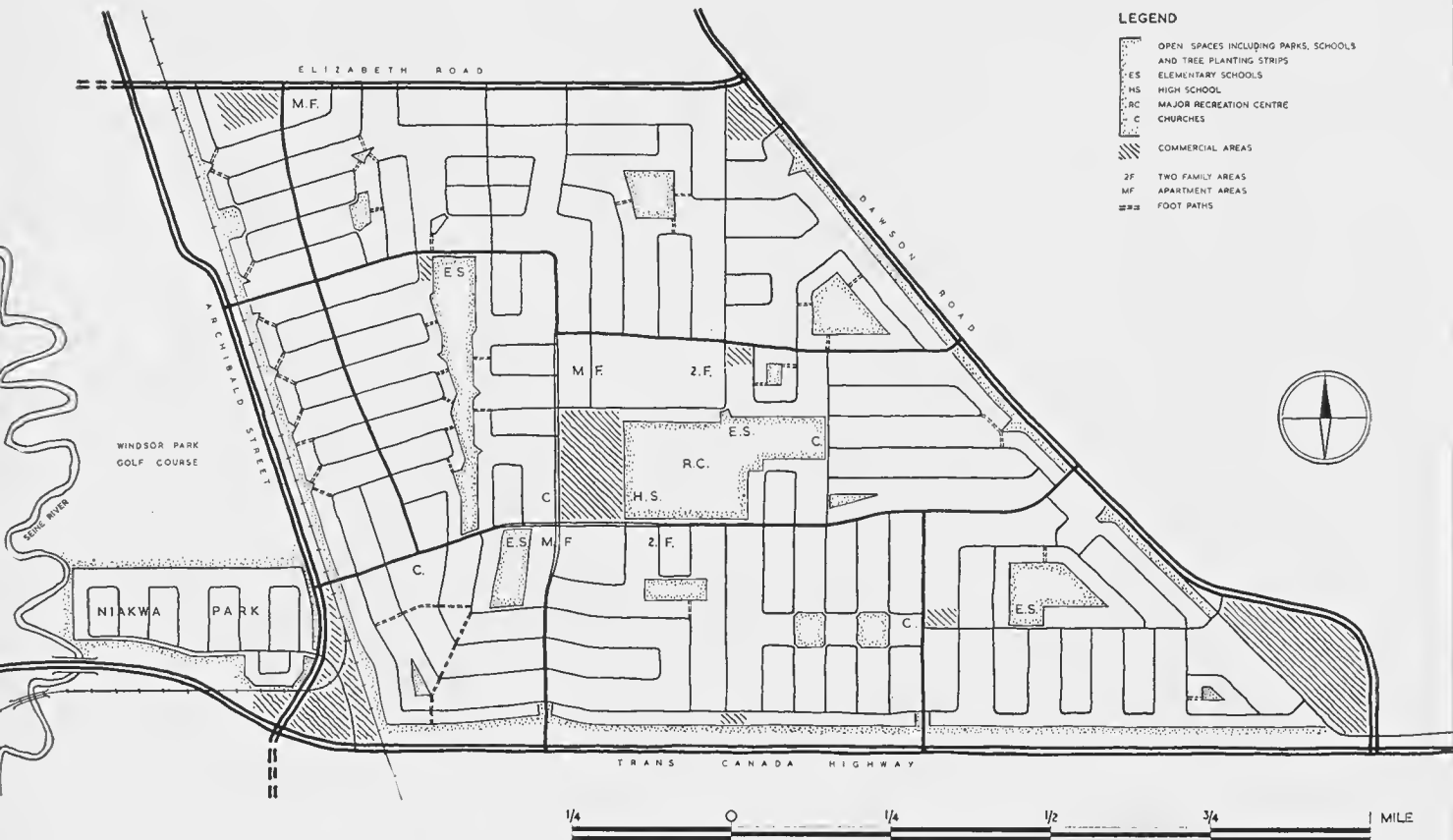
Fortunately, the area is bounded by routes that have already been designated as major thoroughfares. When this is not the case, the main traffic routes have to be worked out in relationship to the thoroughfare system of the metropolitan area so that they are in fact parts of the system. In this case, Dawson Road on the east, Elizabeth Road on the

north, and Archibald Street on the west are all part of the thoroughfare scheme. Since the thoroughfare scheme was originally developed, the Trans-Canada Highway has been located immediately south of Niakwa Road, and it forms the fourth boundary of this whole district. Thus the boundaries of the area were established by existing major thoroughfare routes, with Archibald Street the only one not developed at the time the scheme started. It was possible therefore to start work within the area of the site to determine a reasonable secondary street system to carry the traffic of the interior of the district to the major thoroughfare routes on the boundaries. It was further proposed that all of the local streets serving the individual properties would connect to the secondary routes and thus lead to the thoroughfares. The secondary route system was designed in such a way that it would not provide short cuts through the middle of residential districts which through traffic might be tempted to use rather than the main routes on the boundaries.

Any well-designed street system must pro-

vide routes for underground utilities as well as vehicular access to all the properties in the area. Rights-of-way also must be found for pole lines for power and telephone services to all the properties. It therefore becomes a problem of creating a system which provides adequate traffic access designed on the basis of sound traffic engineering principles but which provides economical routes for underground utilities and adequate rights-of-way or easements for pole lines.

In designing such a scheme, of course, it is necessary throughout to recognize that the properties being created by the establishment of such streets and other rights-of-way are firstly the sites for people's homes, together with sites for schools, for parks and playgrounds, churches, stores, and even for the substations and telephone exchanges. The primary consideration is that these are home sites. If a worthwhile job is not done on the provision of good home sites, then obviously the whole scheme isn't worth all the work and expense. Moreover, unless the sites are attractive to people who intend to invest a great deal of their life's earnings in a home,



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and unless they are satisfied that these are good places to live for many years, then, of course, it is not possible to market them. The promoters investing in such a development must consider this with great care.

Another element that complicated the job in this area was the fact that none of the land was owned by the City of St. Boniface. The land was owned entirely by different individuals, with varying sizes of property from very large ones with many acres down to extremely small ones. While the developer attempted to acquire as much of this land as possible, in many cases it was not possible to buy the land at rates which the company could justify as a land cost for housing. It was, therefore, necessary in some parts of the development to work around existing buildings and properties. This, of course, did create some additional design difficulties. The streets on which these properties were located had to be maintained as part of the new street system.

It will be obvious from this brief description that a great many people were involved in bringing about a plan which appeared to meet, in most respects, the requirements of a good residential community.

Consulting Engineers were involved in designing whole new sewer systems and water systems to serve the area. Complicating the

sewer system was an open ditch carrying surface drainage from an area which extended several miles to the east. The final outcome of this problem was to build a large pipe replacement underground at rather heavy expense. The cost of such a job as this must be spread over all of the development in the area.

In getting the land properly subdivided by means of registered plans of subdivision, complete surveys have to be carried out. This involves a great deal of protracted work by competent land surveyors, both in the office and on the land. Two sections of this scheme have now been completely surveyed for registration.

In connection with the provision of power, the co-operation of the engineers of the Manitoba Power Commission was required to work out the plans for the pole line system and for the main feeder lines and sub-station.

Since it was a land development corporation carrying out the promotion, it is interesting to note how they dealt with the whole problem of technical study and planning of the scheme. The firm of architects and engineers, Green, Blankstein, Russell and Associates, were employed by the corporation to work out the basic schemes for development of the site. The City of St. Boniface employed the consulting firm of W. L. Ward-

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rop and Associates to work out the basic sewer and water schemes which would be required to serve this area and any areas beyond it which would have to be served in the future. Acting on behalf of the City of St. Boniface, the Metropolitan Planning Commission and its staff reviewed the whole scheme from general viewpoints:

- (a) Its relationship to the metropolitan area as a whole.
- (b) Its relationship to the rest of the City of St. Boniface.
- (c) The design of adequate subdivisions.
- (d) The provision of adequate school, park and commercial sites.
- (e) An effective traffic system.

The Commission staff worked directly with all the technical people who contributed to developing a satisfactory plan. This development as it goes along should provide an example of the co-operation necessary to bring about effective development of large tracts of land such as this. Without sincere and willing co-operation on the part of all those concerned, such schemes as this can be easily mired in interminable arguing and bickering. It is, therefore, my opinion that sincere, honest goodwill and a co-operative spirit will do a good deal more to achieve sound development of this sort than all the technical hair-splitting in the world. With so many considerations to be dealt with in developing such a scheme, there had to be compromise here and there along the line. It is because of all participants' readiness and willingness to concede a point when necessary in the general interest that this scheme can be made a practical reality.

As the development proceeds over the next few years other questions will arise and other details will have to be ironed out. If the same spirit, however, pervades the work throughout that has influenced the work up to the present, the possibilities of realizing a fine residential district are assured.

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THE ENGINEER AND CULTURE

By

REGINALD HUGO, M.Sc. (C.E.) (Man.), M.E.I.C., P.Eng.

AT first sight this title may appear to some of you as a contradiction in terms. Engineers have always prided themselves on being a hairy-chested group of he-men, with a great capacity for plebian liquor and an alcoholic disregard for those who won't go along with them.

These qualities have, no doubt, been essential in the construction of thousands of miles of railways, highways and transmission lines, in the exploration of the depths of the earth for its riches of mineral and oil, and in the erection of structures to guard the security and health of the nation and give to it the amenities of civilization. It is a tremendous contribution to society, and we frankly don't care whether society recognizes it or not—as long as the rum lasts. But is it culture?

In one important sense it is, but to those individuals who prefer the group description of their profession, any suggestion of culture sounds sissy. The word conjures up art galleries, symphony concerts, poetry societies and other manifestations ordinarily designated as "long-hair." It is a fact that Einstein was a long-hair but he had something to do with the atomic bomb, and although there are many long-haired scientists, they generally are a pretty practical type. But there is no analogy with long-haired artists. There is nothing in common between them and practical people—so you say.

This belief arises from a misconception of what culture is. Every profession requires its long-hairs, although their relation to the body of the profession may be obscure to outsiders. The error arises from not recognizing the culture represented by the long-haired artists.

Culture is not easy to define, as it has different meanings under different circumstances. When the Massey Commission published its excellent Report, an editorial in Maclean's Magazine, which highly complimented the Report, said it had only one omission—it did not define culture.

In the broadest sense, culture may be called the manner in which a man spends his leisure. This certainly influences the cultural level of a community but could include attendance at horse races or bridge parties. A narrower definition would indicate that the leisure should be spent profitably, but there are some people who find profit in horse-racing and bridge.

The culture of a group is certainly a mark of its distinctive qualities. It is the subject of first enquiry on digging out an old civilization or exploring a new community. Its tools and utensils, the materials for building its structures or making its clothes, the manner in which its possessions are decorated and the form of its religion—all contribute towards an understanding of its culture and combine to identify it and set it apart. In accordance as its culture is high or low it is designated as civilized or barbaric.

In this sense, it is impossible for any group not to have cultural significance. It is either cultured or uncultured, and engineers as a part of a highly-civilized modern society to which their profession makes an outstanding contribution have every right to identify themselves as members of a community with a high cultural level.

It is obvious, however, that when we come to the individual this isn't good enough. Without further exploring all the meanings of the word culture, may we say that it is the expression of the creative faculties in a man. We all have this need to express ourselves, often in a manner which will identify the work as our own, but certainly in a way which gives free outlet to our desire to be an individual; to do something different or better than anyone else.

A few primitives have natural gifts, but the untrained will generally express themselves in strange, fantastic, exaggerated or

Mr. Hugo graduated from Manitoba with two medals to his credit. He is currently the chief bridge engineer for the western region of the C.N.R. He has served as president of the Canadian Federation of Music Festivals; president, Men's Musical Club of Winnipeg; president, Manitoba Musical Festivals; and president, Winnipeg Civic Music League. He is honorary president and a past president of the Winnipeg Lawn Tennis Club; first vice-president, Canadian Lawn Tennis Association; and president, Manitoba Lawn Tennis Association. We feel he is well qualified to relate engineering and culture.



*Opening concert, Winnipeg Arena, October 20th, 1955.
Massed choir and orchestra singing Handel's "Messiah,"
Donald Leggat conducting; presented by Men's Musical Club.*

distorted forms. We think of flag-pole sitting and weird marathons, hot rods and zoot suits, Toronto's Casa Loma and Miami's Vizcaya, the filling stations of the twenties and the resort hotels of today, the outlandish hobbies of some people and the more outlandish "private" homes of others, and one might add a large proportion of modern music, painting and poetry.

Except for a few geniuses, it takes a high degree of training even to appreciate, much less produce, worthwhile modes of expression, whether in the form of painting, poetry, literature, music, sculpture, architecture or one of the other arts, or in that wide field classed as handicrafts. Those whose abilities are limited to appreciation may express themselves as critics, or their outlet may be in the field of organization or administration or by financial support. Where does the engineer fit into this picture? Does his training qualify him to be of value in the cultural life of his community or towards his own cultural development?

Unless the answer is in the affirmative, then this article need not have been written. The laws of probability will stipulate, first, that a certain number of people in a group will be culturally minded; and second, that a

percentage of this number will be engineers. Unless something more than chance can be invoked, there is no purpose in advancing special reasons linking engineers and culture.

There is, of course, a negative reason, for if an engineer is carried away by the masculine qualities of his profession to the extent that he snubs all culture, he denies himself the benefits of understanding the great cultural evolution of mankind and of appreciating the great works of art which are our heritage. He cuts himself off from a large segment of mankind and the experience which has led them to express themselves in such a talented manner.

But a more positive reason is required than a mere avoidance of ignorance, and there is no doubt that the temperament and training of an engineer are valuable assets in expression through the arts. In earlier times this has been made apparent, and, in fact, the earliest engineers of our Western civilization, the "architectons" of ancient Greece, have left monuments to their abilities which are at the same time marvels of art. To a lesser degree the Romans made their contribution, although these more practical people showed a gain in engineering skill at the expense of art.

Most of these ancient examples were limited to public works, and it is many hundreds of years before the scope of engineering made it possible to apply in other fields principles of beauty associated with utility.

Perhaps Leonardo da Vinci is the greatest exemplar of the engineering mind applying itself to all branches of culture. The Renaissance gave full opportunity to this engineer, painter, sculptor and architect, and his energy and talent made him a genius in all fields. He is known chiefly for his paintings, "The Last Supper" and "Mona Lisa," and a number of lesser works; but he was also a foremost mathematician and an inventor of mechanical devices, and spent many years as a chief engineer in the service of Italian Princes, in charge of harbors, canals and other works of the times.

His life should be required reading for all engineers, giving insight as it does to the relation between scientific knowledge and artistic expression, and to find, for instance, that "The Last Supper," whatever it may be artistically, is also an exercise in perspective.

Geometry and the graphic arts are associated. A knowledge of materials is essential to expression in sculpture and architecture. Mathematics and music are closely related.

It is not an accident that Einstein played the violin. The harmonies of music are based on harmonic progressions, and the work of Helmholtz establishing these relations is still a classic after almost a hundred years.

Above all, that great and universal failing of engineers, the inability to express themselves favourably by word or speech, requires development through a knowledge and appreciation of the sound and beauty of language, the arts of singing and literature.

Until the close of the nineteenth century many scientific minds showed a wide grasp of other fields of knowledge, but since then learned people have suffered from a form of specialization which has blinded them to matters outside their own. The trend is changing, but slowly. Scientists have forgotten that their field began as Natural Philosophy, an enquiry into the facts of life on which to base their understanding of life. Engineers are applied scientists. The fundamentals of nature as understood by the engineer are of the same stuff from which great art has come. The engineer should develop his philosophic curiosity and thereby not only acquire a respect for art but perhaps proficiency in it.

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TITANIUM

By

CHARLES M. HOVEY, B.Sc. (C.E.), M.Sc. (Man.), M.E.I.C., P.Eng.,
Professor of Civil Engineering

THE world-wide interest in supersonic flight, which arose almost immediately after the successful production of jet-propelled aircraft, awakened interest in the potentialities of the metal titanium. Because of its high strength-weight ratio, corrosion resistance, plentiful ore supply, and promise of exceptional high-temperature properties, both research and production of the metal have been heavily subsidized, particularly by the United States government. The rapidity of the development of this metal has been unprecedented in world history. Two and one-half tons of the metal were produced in 1948. The expected production in the United States for 1956 is 15,200 tons!

The intense interest in titanium, which is apparent from the number of technical papers concerning it which have appeared, stems from two important factors. These are (1) the abundance of raw materials and (2) the properties of the metal.

Titanium is the fourth most abundant element having structural possibilities in the earth's crust. Only aluminum, iron and magnesium are more plentiful. Large deposits of rutile (TiO_2) and ilmenite (FeTiO_2) exist in the United States, but the largest known deposit of titanium ores is in eastern Quebec. It is estimated that this deposit alone can yield at least 50,000,000 tons of titanium metal.

One of the major reasons for government subsidization of titanium development is the fact that it is one of the few metals which does not involve importation from overseas sources.

The extraction of ductile titanium from its ores is difficult because of the chemical activity of the metal. It has been called the universal solvent since it dissolves oxygen, nitrogen and hydrogen, and, in the molten state, reacts with all known refractories. Many problems have had to be solved in winning it. At present, extraction is a two-stage process.

The first stage consists of beneficiating the raw material to a state where it is basically pure titanium dioxide. The second stage

consists of reduction of this oxide to metallic titanium. At the moment the only method being used commercially is the Kroll process. Briefly, this involves heating titanium dioxide mixed with carbon in a stream of chlorine. This results in the formation of titanium tetrachloride as an impure liquid. This liquid is purified by redistillation and is then reduced by means of molten magnesium in an evacuated chamber. The products of this reaction are magnesium chloride and titanium. The titanium sinks to the bottom of the liquid magnesium in the form of a spongy mass containing magnesium chloride in its interstices. The sponge is removed and, after cooling, the magnesium chloride is leached out.

The magnesium chloride is passed through an electrolytic cell, recovering both the

Titanium has become an important material in the aircraft industry



chlorine and magnesium, which are then re-cycled.

The sponge is later melted into ingots. No phase of titanium technology has been beset with so many exasperating difficulties. Some of the first ingots were produced by melting in a graphite crucible. The melted metal dissolved from 0.2 to 0.6% carbon from the crucible and had properties greatly inferior to metal now available, which contains less than 0.03% carbon. The present technique consists of what is called double melting. In this process, a titanium electrode is used to melt a quantity of titanium sponge held in an evacuated water-cooled copper mould. The electrode, of course, is melted and mixes with the charge. The first ingot produced is used to manufacture electrodes. These electrodes are then used again, the resulting ingot being formed of metal which has been melted twice. This double melting process produces an ingot which has less segregation and more uniform properties than is otherwise possible.

Ingot up to 26" diameter weighing 4,000 lb. are being produced in commercial quantities by this method. These ingots are turned in a lathe to remove a $\frac{3}{8}$ " skin of surface imperfections and to assure soundness of further products.

Conventional methods are used for rolling sheet, and bar, or for forging the material.

It will be obvious from the description of the methods used in its production that the price of the metal must be high. Sheet and bar material of commercially pure titanium and its alloys cost from \$12.00 to \$15.00 a lb. today. It is felt that this price may be cut in half when production rises to about 35,000 tons per year, but that further reductions will not be possible unless new methods are devised for production of sponge and melting of ingots.

In spite of this high cost, which is about twice that of silver, titanium is being used

today in a variety of applications and has been so successful that its future as a structural material is assured. The reasons for this assertion are found in the unusual properties possessed by the metal and its alloys.

Pure titanium, which can be produced in small lots only by exceptionally careful and expensive laboratory processes, has the following properties:

Ultimate strength	35,000 psi
Yield strength	15,000 psi
Elongation in 2"	55%
Reduction of Area	80%

These properties are not outstanding and are similar to those of pure copper.

Commercially-pure titanium, as produced by the Kroll process and double-melting technique, contains over 99.5% titanium. The remainder consists of not over 0.20% Fe, 0.10% N, 0.07% C and 0.02% W, with a trace of oxygen and hydrogen. Although this is called commercially pure titanium, it is, by strict interpretation, an alloy and has the following mechanical properties in the annealed state:

Ultimate strength.....	80,000 psi min.
Yield strength	70,000 psi min.
Elongation in 2'	20% min.

This material does not respond to heat treatment, but may be cold-worked to above 120,000 psi tensile strength.

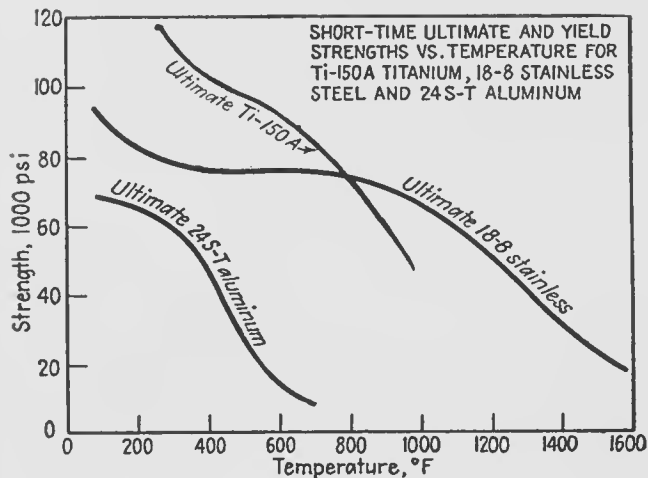
The analysis and comparison of "commercially-pure" with "pure" titanium shows that small quantities of gases and other elements greatly influence the mechanical properties. This is particularly true of the gases, which dissolve interstitially, increasing the strength and reducing the ductility.

Many alloys of titanium have been developed. One of them commonly used in annealed bar form contains 2% Fe, 2% Cr, 2% Mo, and has a tensile strength of over 130,000 psi with 12% elongation.

Titanium, like iron, is one of the very few metals which exists in two space-lattice arrangements. At room temperature it exists in the close-packed hexagonal form but changes to body-centred cubic at 1615°F. Consequently many of the alloys can be quenched and tempered in a manner similar to steels. Such alloys have strengths which may exceed 200,000 psi.

From the foregoing it can be concluded that the strength of titanium and its alloys is equivalent to that of the structural alloy steels in common use. It should also be observed that the lowest strength of commercially pure titanium is nearly as strong as the strongest aluminum alloy 75S-T.

When we add to this the fact that titanium is only 56% as heavy as steel (although 60%



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heavier than aluminum it becomes obvious that the metal is very desirable for aircraft.

In addition to its great strength-weight ratio, which is about double that of either steel or aluminum alloys, it has remarkable corrosion resistance. Against sea-water corrosion it outstrips all metals except platinum. It is immune to atmospheric corrosion and resists attack by many acids and alkalis which vigorously attack other metals such as steels, aluminum and magnesium. It is useful, for example, as a fuel container for guided missiles using fuming nitric acid.

Its high melting point of over 3000°F makes it ideal for fire-walls in aircraft engine installations. Where structural strength must be maintained, sustained temperatures beyond 800°F result in creep and metallurgical instability. Aluminum alloys, however, lose most of their strength at 400°F. It is, therefore, between 400 and 800°F that titanium has better structural characteristics for aircraft use than any other known material.

It is the only material suitable for the wings of aircraft flying at speeds of 1,500 mph or higher, since air friction heats the wing surfaces to over 400°F at this speed.

At outside air temperature its strength-weight ratio makes it an economical material for transport aircraft. Extensive use of titanium would permit a present-day 60-passenger plane to carry 80 passengers. Engine nacelles and other parts of the Douglas DC-7 are now being made of titanium. Titanium nuts and bolts, of strength superior to present alloy steel bolts, are in production and will save hundreds of pounds of dead weight in a modern aircraft. Titanium has been used in mortar bases and other portable weapons as well as in armour plate for tanks. In such uses titanium has proved to be completely satisfactory. The saving of weight, particularly for air-borne equipment, is very significant.

In marine application its resistance to cor-

rosion is certain to result in many future uses.

As with any new material, the true assessment of titanium's value must be gained by actual experience. This statement has been only too well borne out by early attempts to fabricate the material. There have been many stories of production runs where the pile of finished parts was smaller than the piles of scrap and ruined tools. Research and experience have largely eliminated most of the difficulties encountered in machining titanium. These difficulties result from the high temperatures and stresses produced at the cutting edge of the tool, which may reach 2000°F. By using adequate cooling, slow speeds and sharp tools ground to the proper angles, any of the presently available titanium alloys can be successfully turned, drilled, milled, reamed, and sawed. The most difficult operation is the tapping of internal threads. This is due to the large torque required and to the tendency for the tap to seize.

Early attempts at grinding titanium were very disheartening. More material was worn from the wheel than was cut from the work-piece. By reducing the wheel speed to about half the generally accepted value for steel, this phenomenon has been eliminated and grinding under these conditions is little different from grinding steel. The reason for excessive wheel wear at conventional speeds appeared to be that, at the high contact temperatures, the abrasive dissolved or alloyed with the titanium and was therefore carried away with the material removed from the work.

Bending and forming sheet titanium was unsatisfactory two years ago, but is now much easier, due to improvement in the material. Early material varied from sheet to sheet to such an extent that uniform results could not be obtained. For severe forming operations the work must be heated to 800°F.

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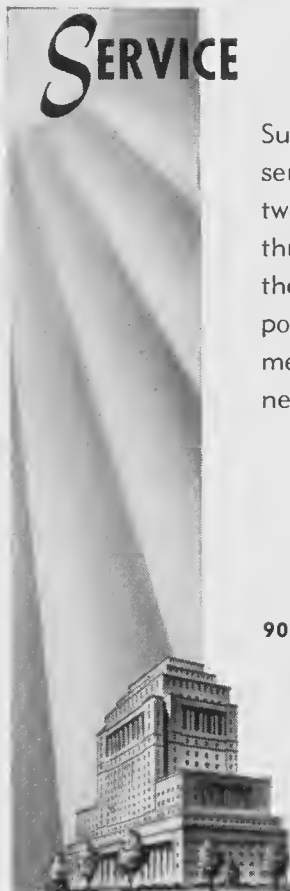
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Casting of titanium is not possible except in special processes where the air can be excluded completely.

Welding of commercially pure titanium and a few alloys is possible by arc and resistance methods. In arc welding it is essential that both upper and lower surfaces of the material be shielded by an inert gas such as argon or helium to protect the heated metal from air contamination. The protective atmosphere must be maintained until the heated zone has cooled to 1450°F. Best results are obtained when no filler metal is used. The welds so produced are stronger than, and have comparable ductility to the parent metal.

In various processes where titanium is heated it develops brown or blue oxide scale. This scale can be removed by pickling in hydrofluoric acid. However, the use of this acid alone causes severe hydrogen embrittlement of titanium. A mixture of 2% HF with 47% HNO₃ is effective in removing scale without producing embrittlement.

Various processes such as brazing, electroplating, anodizing, forging, extrusion and so forth, have all been applied to titanium successfully. It seems certain that the elimination of the few fabrication difficulties which still exist will be accomplished in the near future.

From the facts which have been presented, the use of titanium and its alloys appears to

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be well-established but definitely limited to specific areas.

- Its high strength-weight ratio at ordinary temperatures makes it an economically attractive material for fastenings and many other components of civil and military aircraft.

- Its superior properties at temperatures between 400 and 800°F make it the best available material for aircraft components operating in this range.

- For military uses where weight is important, such as in air-borne equipment or ordnance which must be carried by the infantry, it has the advantage of being only half the weight of steel.

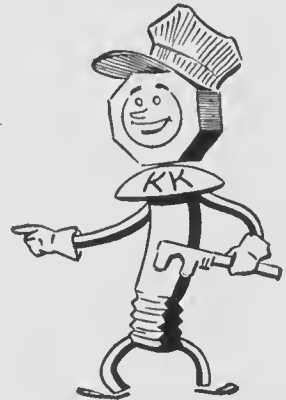
- For marine use its salt-water corrosion resistance will result in its use wherever the cost of replacement of an inferior material is high enough to warrant the high initial cost of titanium.

- For industrial and home use its high cost will undoubtedly limit its use to applications where its special corrosion resisting properties may make it attractive.

As the price of titanium declines and as newer, better alloys are developed, its horizons will obviously become broader. It is amazing to consider that so much progress has been in the technology and metallurgy of this metal in a period of approximately nine years. The future may well lead to even more astonishing developments.

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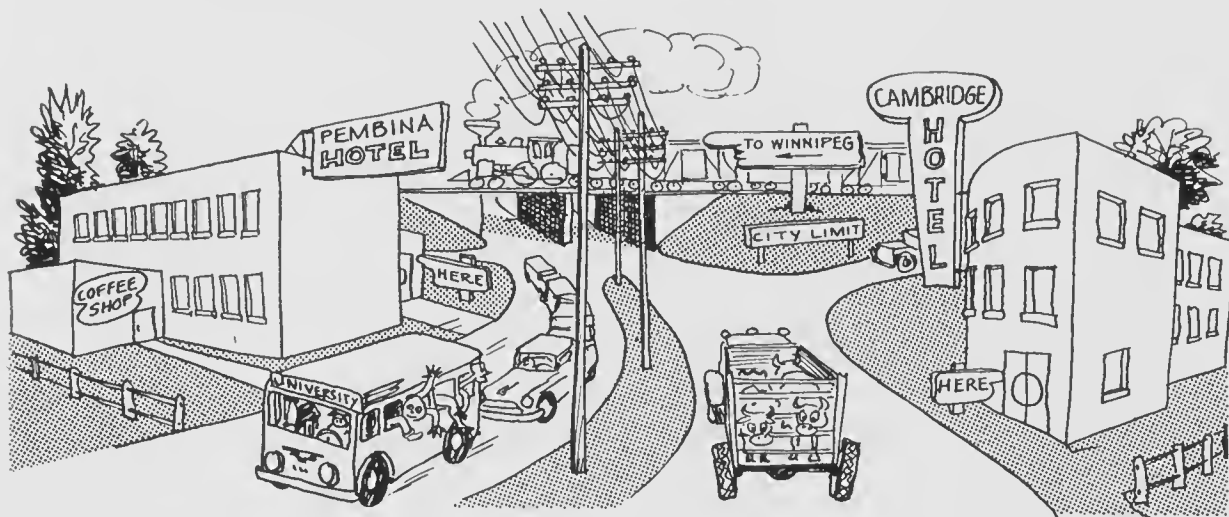
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The Engineer and John Barleycorn

By ERIC BURNHAM-SMITH

THE subject of alcohol rarely fails to stir up interest. To someone who approves, it conjures up memories of jovial fellowship among old acquaintances and the anticipation of the next convivial occasion. To someone who disapproves, the word alcohol is fuel to his fire of indignation, which might be kindled into a barrage of invective against this virulent wrecker of human lives. Indifference toward alcohol is like indifference toward any other contentious issue, like politics, art, religion, fluoridation, labour, sex, communism, and coloured margarine. Which is more to be censured: apathy or excessive enthusiasm?

It seems a particularly appropriate time to talk about alcohol in view of the recent report of the Bracken Commission on the alcoholic welfare of the province, and even more recently, that notorious game of capacity—that nefarious escapade of delinquency—the Beer Drinking Contest. It was at this regrettably over-publicized sporting event that the number sixty-four took on new meaning among the Engineers at Manitoba. Besides these two new major developments, with their various ramifications, there are

always those pillars twain at the Gateway to Fort Garry (the Cambridge and the Pembina respectively) and the annual stag to sustain interest during off-seasons.

It would hardly be fitting to extol the merits of these worthy or noteworthy ventures. But they do exemplify what has long been claimed dogmatically by some: Beer is considered the Engineers' favourite beverage, and no Engineer who abstains can hope to reach social esteem or professional recognition. In some people's books, the inability to consume is worse even than the inability to play golf or bridge, or recite the latest statistics on the American League or the new Lincoln Continental. It is those who drink the most and boast the loudest about their own remarkable capacity who probably know the least about its place in society.

Well, with so many noble souls attempting to choke down gallons of this amber elixir called beer while having an education thrust down their unwilling throats, the thought occurs that few of those noble souls are familiar with the industrial process used in its production.

The Ingredients of Beer

Beer is a fermented cereal beverage. Here is the magic recipe for brewing one barrel:

1. One bushel of barley malt.
2. Fifteen pounds of adjuncts.
3. One and a third barrels of water.
4. One pound of hops.
5. One pound of brewer's yeast.

Variations in the amount or variety of any ingredient will produce a different type of beer.

Malt.—Barley has been used for centuries because it produces malt with precisely the properties required. Special "malting-barley" has been developed by plant breeding and selection. The kernel contains starch, protein, and enzymes. The process of malting consists of soaking the kernels and then allowing them to germinate. Germination increases and distributes the enzymatic systems for efficient conversion of the starch to fermentable dextrins and sugars, chiefly maltose. It also makes the protein soluble. Malting is completed by kilning, a roasting process which arrests germination, reduces moisture, and imparts flavour, color and aroma to the malt. Low kilning produces pale malt, while high kilning produces black, caramel, and dextrin malts.

Adjuncts.—Any number of other cereal products may be added to the malt to give the beer a paler colour, a less-cloying or snappier taste, clarity, and increased stability to bottled beer. The most commonly used adjuncts are corn grits, corn meal, corn flakes, or polished rice. Unmalted barley, wheat, soybeans, various corn sugars and corn syrups are also used extensively. Whatever is used makes the difference between Shea's and Drewry's.

Water.—Because beer contains 90% water, its purity is important. It is desirable to contain substantial amounts of calcium salts, because the dissolved calcium ions stimulate enzyme activity, starch saccharification and protein degradation. The calcium improves clarity, colour, and stability, and helps extract the flavour from the hops. Any bicarbonates in the water are undesirable because they counteract the effect of the calcium ions. The other chief salts are phosphates. Water containing undesirable solutes is treated in the brewhouse before use.

Hops.—These are the dried clusters of flowers of the female hop vine, known botanically as *Humulus lupulus*, and can be grown in this country. They are greenish yellow and sticky, and resemble large clover blossoms. They impart a bitter flavour and pleasant aroma to the beer, which gives it the refreshing quality. Besides its foaming

and clarifying properties, hop extract is a tonic which stimulates digestion. As little as a third of a pound is used for weak lagers, and as much as three pounds for strong ales.

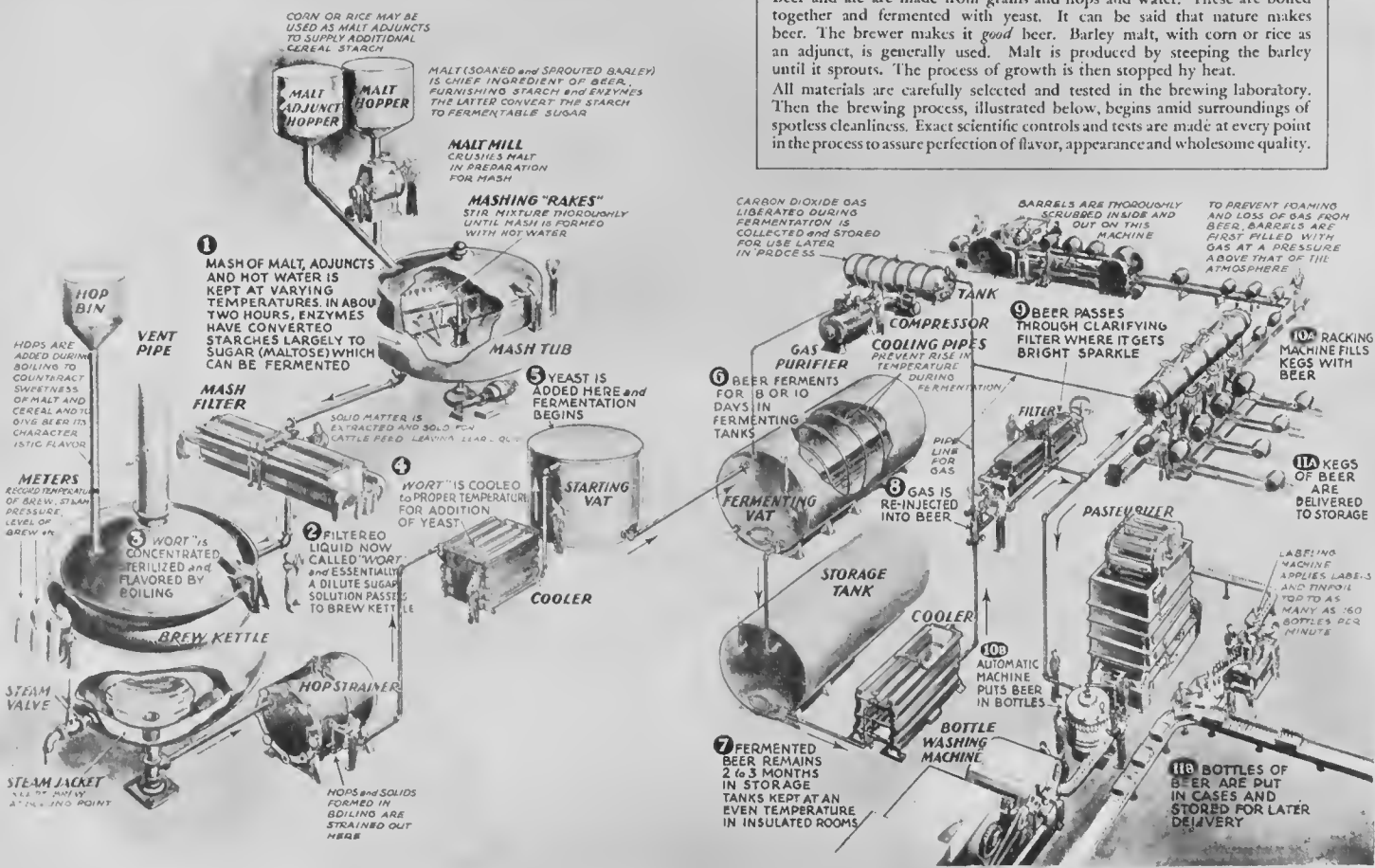
Yeast.—Brewers' yeast is a thick, ivory-coloured liquid mass of single-celled organisms, which has the catalytic power, through its enzyme, *zymase*, to split maltose into equal parts of ethyl alcohol and carbon dioxide. This is called fermentation. During this process the yeast multiplies itself to about three times its original volume by feeding on the proteins and dissolved phosphates. When one batch of beer is fermented, the yeast is simply moved on to the next batch, and thus a brewery need replace its yeast only when degeneration reduces its effectiveness. Other yeasts ferment differently, producing characteristic qualities in beer. For example, top fermenting yeast which floats on the surface is used for ale, stout, and porter on highly fermentable malt, and takes about six days. Bottom fermenting yeast which settles to the bottom is used for lager and takes as long as twelve days.

The Process of Brewing

1. The malt is crushed and ground, mixed with the appropriate type and amount of adjuncts in a cylindrical vessel called a "mush tun" where it is steeped in hot water for two to four hours.
2. The resulting mash is filtered to remove all solid material, and is then called "wort." The solid material is sold for cattle feed.
3. The wort flows by gravity to a large copper brewing kettle, where hops are added, and the whole is boiled to extract the valuable tonic and flavouring elements from the hops, coagulate the proteins, destroy the malt enzymes, and sterilize and concentrate the wort. This requires about two hours.
4. The wort is drawn off and conveyed to a "hop-jack," where the hops are strained out to prevent excessive extraction.
5. The wort is then cooled, the sludge of coagulated protein removed by sedimentation or filtration, and finally aerated for proper fermentation.
6. Yeast is added to the wort in a starting tank, where it is kept for a day before passing to the main fermenting vat. After much foaming, the beer becomes saturated with carbon dioxide, and the excess is collected, compressed and stored.
7. When fermentation is complete, the beer is drawn off to a glass-lined steel tank and allowed to mature slowly and naturally for about a month. "Lager," which means "stored," requires up to three months.

HOW BEER AND ALE ARE MADE

Beer and ale are made from grains and hops and water. These are boiled together and fermented with yeast. It can be said that nature makes beer. The brewer makes it good beer. Barley malt, with corn or rice as an adjunct, is generally used. Malt is produced by steeping the barley until it sprouts. The process of growth is then stopped by heat. All materials are carefully selected and tested in the brewing laboratory. Then the brewing process, illustrated below, begins amid surroundings of spotless cleanliness. Exact scientific controls and tests are made at every point in the process to assure perfection of flavor, appearance and wholesome quality.



Drawing by courtesy of POPULAR SCIENCE MONTHLY.

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8. Beer is then carbonated from the stored gas by injection under pressure.
9. Isinglass or vegetable gelatin is added to obtain brilliancy, and the beer is again filtered for clarification.
10. The beer is sent to a racking machine for filling kegs, or a bottling machine for filling bottles.

Racking

Before beer or ale is packaged in kegs, the kegs must be clean both inside and outside and must be leakproof. Cleanliness is ensured by washing the kegs thoroughly. The kegs are then filled with compressed air and submerged in tanks of water to detect any leaks. If a keg should prove to be defective, it is repaired by coopers and repitched. Aluminum kegs are now widely used.

Following these tests the kegs are placed in a machine called a "racker" to be filled. Finally, bungs are inserted and the kegs are ready for shipment.

Bottling

Bottles are first placed in a soaker which removes old labels and sterilizes the bottles with a hot solution of caustic soda. They are

next rinsed both inside and outside. Moving on an endless belt they are inspected and any defective bottles removed. Then the bottles are filled and capped. Next the bottles move to pasteurizing tanks, where they are immersed for over one hour in water at a rigidly controlled temperature. Following pasteurization, the filled bottles are inspected under a magnifying glass and then the labels are affixed. After the labelling operation has been completed, the bottles are packed in corrugated paper cartons and are conveyed to the shipping room.

Although the process appears relatively simple, it requires very careful control of quantity, temperature, timing, mechanical handling and sanitation to yield a quality product. The job of brewmaster is one of exacting skill.

Some Inert Facts

The active ingredient in beer, physiologically, is ethyl alcohol, representing about 4.1% by weight for all Canadian beers. It may be expressed as 5.1% by volume. This is stronger than British or American beers, which run about 3.6% and 3.3% by weight respectively.

Just so as to completely confuse, confound and astound the public, alcoholic strength is also measured by British proof spirits, where pure alcohol is called 175.35 proof spirits. On this basis, Canadian beer contains 9% proof, the legal limit. We in Manitoba need not be ashamed of our locally produced beverages, since they contain between 8.6% and 9.1% British proof spirits. The label on the bottle, which guarantees not less than 2½% alcohol, means 2½% British proof spirits, below which a beverage is no longer regarded as alcoholic. Breweries were permitted to manufacture a mild beverage of this strength during prohibition between 1916 and 1923. With their usual independence, the Americans have invented a new system of designation, in which pure alcohol is called 200 proof. If Ontario, Quebec, or Alberta beer seems stronger, it's not due to extra alcohol but rather extra hops.

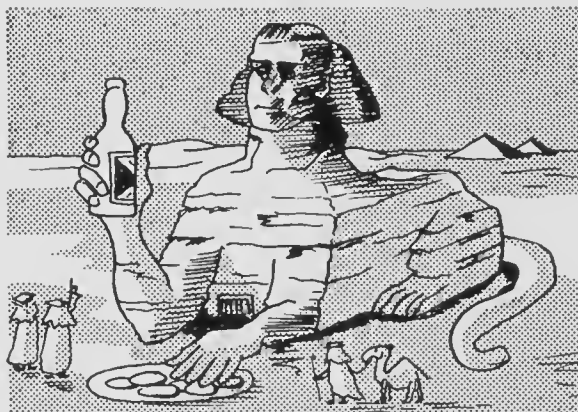
Lager.—Lager beer may be pale to dark in colour and is made from malt of low conversion. It undergoes further slow fermentation after put in cold storage. Because of its storage properties, lager became popular in this country in the nineteenth century before refrigeration made summer storage easy.

Ale.—Ale takes a shorter time to manufacture, and has a pronounced hop aroma and flavour, which makes it stronger. It is fermented by yeast of the top fermenting type which adds a distinctive character. It originated in the British Isles, where beer contains the most hops and the least carbon dioxide.

Porter.—Porter is also a top fermentation beer, but heavier and darker than ale. Some high dried and roasted malt is used. It is less hoppy and sweeter in taste than regular ale.

Stout.—Stout is similar to porter, but of very dark colour, has a sweet taste, and a strong malt flavour, due to the burnt or caramelized malt used in its manufacture. It is heavier than porter and possesses a stronger hop character.

Beer has a definite nutritive value according to the Laboratory of Applied Physiology, Yale University, which says, "Beer is a beverage, but, like milk, it is a food." Besides its 4% alcohol, which shouldn't be regarded as a food, it contains about 1% dissolved carbon dioxide, and about 5% dissolved solids, the remainder being water. One pint of beer contains 200 calories and is rich in vitamin B, particularly fiboflavin, niacin and panthothenic acid. Most of the thiamin in the malt is destroyed in fermentation. The hop resins have a healthful tonic effect. Dietitians agree that beer is not fattening; but beer stimulates the appetite, gluttony brings on obesity, and indolence discourages exercise.



History

Beer has been brewed for six thousand years in Egypt. It was popular in ancient China, was known by Armenians, Gauls, and Greeks. A sample of Rome's beer was unearthed in 1911. By edict, the Norse King Haakon made beer the official festival drink in the tenth century. The Roman Catholic Church, as the seat of learning and culture through the Dark Ages and the Renaissance, was also the custodian of the land's breweries, with its clergy and bishops actively engaged in the trade of grain and beer.

It was not until the fourteenth century that beer, as we know it, reached full flower in Germany, Holland, and Denmark. The Protestant dean of St. Paul's, London, first introduced bottled beer in 1561, and thirty years later North America saw its first native brew. The first brewery in Canada was founded through the efforts of Jean Talon, Intendant of New France. Soon after his arrival he became concerned about the general use of spirits and its effect upon the colonists. To promote temperance, he built a brewery in Quebec City in 1668 on the shore of the River St. Charles.

Since the turn of the century, beer has skyrocketed to popularity, while hard liquor or spirits, containing eight times as much alcohol, has actually diminished in per capita consumption. Prohibition during the nineteen-tens-and-twenties led only to widespread bootlegging, illicit distilling and home-brewing. Crazy alcoholics gulped down anything from Shirriff's lemon extract to Vitalis hair tonic. The Women's Christian Temperance Union has never realized its most cherished dream, while the Salvation Army and Alcoholics Anonymous in their excellent activities will never want for clientele. After a long and colorful history, it seems evident that alcohol is a permanent fixture in society. Is it not regarded as a necessary ingredient when minds are most elated in celebration?



Is it not a consolation and a resort when spirits are most dejected with melancholy? Is it not party to the very essence of Eucharist? Well, then, we have it; now what are we to do with it?

The Drinking of Beer

This heading might anticipate the answer, but the answer is rather complex. Nobody likes to be told how to handle his liquor. It is here that the ice becomes very thin, because it is easily the most contentious part of the story.

There is nothing particularly meritorious in getting rory-eyed drunk, just as there is nothing particularly admirable about the person who endlessly expounds the dangers of alcohol. The one is contemptible; the other tiresome. But they do have one thing in common—they are both extremes.

Almost anything we may examine is beset with extremes. Politicians rub shoulders with people who refuse to vote. Art galleries have their Professor Swinton's and their Mrs. Waines's. Religious fervour is no less common than Godless atheism. The antics in municipal council chambers become hostile parley when the battle lines are drawn over a perfunctory matter like fluoridation or coloured margarine. Could anything be more

extreme than the current unreasonable demands of labour or the niggardliness of management, unless it be the bad taste of over-ornate mid-Victorian architecture and the absence of taste in contemporaneous functional design? Walking the same streets are sex maniacs and prudes. Inside the church there is ranting from the pulpit; outside, there is swearing from an inebriate.

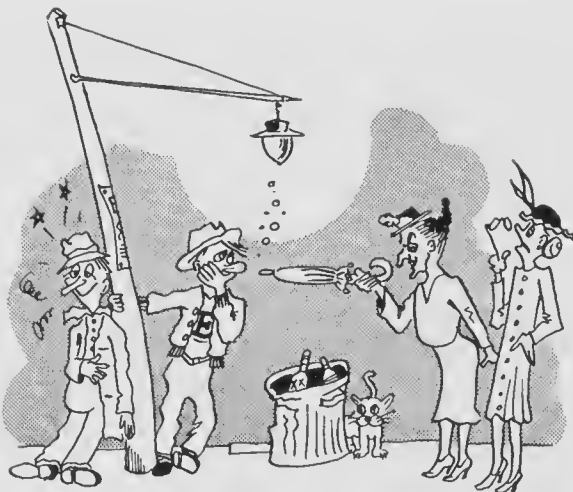
What has happened to the golden mean? Is Plato so antique that his cardinal virtues are repugnant to modern thinking? The third virtue is temperance. Webster defines temperance as habitual moderation in the indulgence of the appetites and passions. The important word is *moderation*—the middle of the road—the golden mean—the key to the problem. Moderation does not mean abstinence, for abstinence is an extreme, just as surely as alcoholism.

Moderation works in other fields. Labour problems are settled by conciliators. An abundance of good painting and music is enjoyed by millions. Those suffering headaches take codeine in their 222's without becoming addicted to drugs. Most people in this country are able to eat without experiencing either malnutrition or corpulence.

Why then, in a world torn by political wrangling, feverish with business tension, and confused by a schizophrenic society, should not resort be made to a remedial tonic? Anything which contributes to the good cheer, fellowship and conviviality among mankind deserves commendation. Used in moderation, alcohol must be considered, and the alcoholic beverage of moderation is beer. It may well be toward this end that the Bracken Commission is directing our welfare with its broad recommendations.

But the important feature above all is moderation, which can only be ingrained by a comprehensive program of alcohol education. Those institutions, where feelings sometimes run strongest, the churches and schools, should take the lead in this direction. The absence of alcohol education is evident from the widespread belief of many erroneous ideas. The following are scientific findings by competent researchers:

- Alcohol is not a food, and contains no nutritional value. It can best be regarded as an organic drug.
- Alcohol is not a stimulant, but rather a depressant which dulls the senses and lowers functional activity. However it breaks down the barriers of inhibition, and gives a sense of well-being, power, and humour. It encourages conversation, and overcomes modesty.



• Mixing drinks will not induce nausea, but improper food eaten at the same time will.

• Alcohol has its maximum rate of intoxication on an empty stomach, and its effectiveness is most reduced when proteins such as meat, eggs, fish and cheese are eaten before or with.

• No one can develop an ability to consume, regardless of how much practice he undertakes. The average person, via the liver,

can break down only three-quarters of an ounce of alcohol per hour, whether a regular offender with a police record or a teetotaling schoolmarm. The only difference is that the former is familiar with the feeling and acts staid, while the latter is unfamiliar and acts hysterical.

• There is only one known remedy for over-indulgence or a hangover—time.

Conclusion

The art of brewing is ancient and honourable; it is a social calamity that the art of drinking has never attained the same degree of perfection. However, as Charles Lutwidge Dodgson might have said in closing:

*Said the Walrus to the Carpenter,
"When all is said and done,
Let's drop in at the local pub,
And have another one."*

And remember, according to the Master Brewer's Association of America, serve it between 38° and 42° F.

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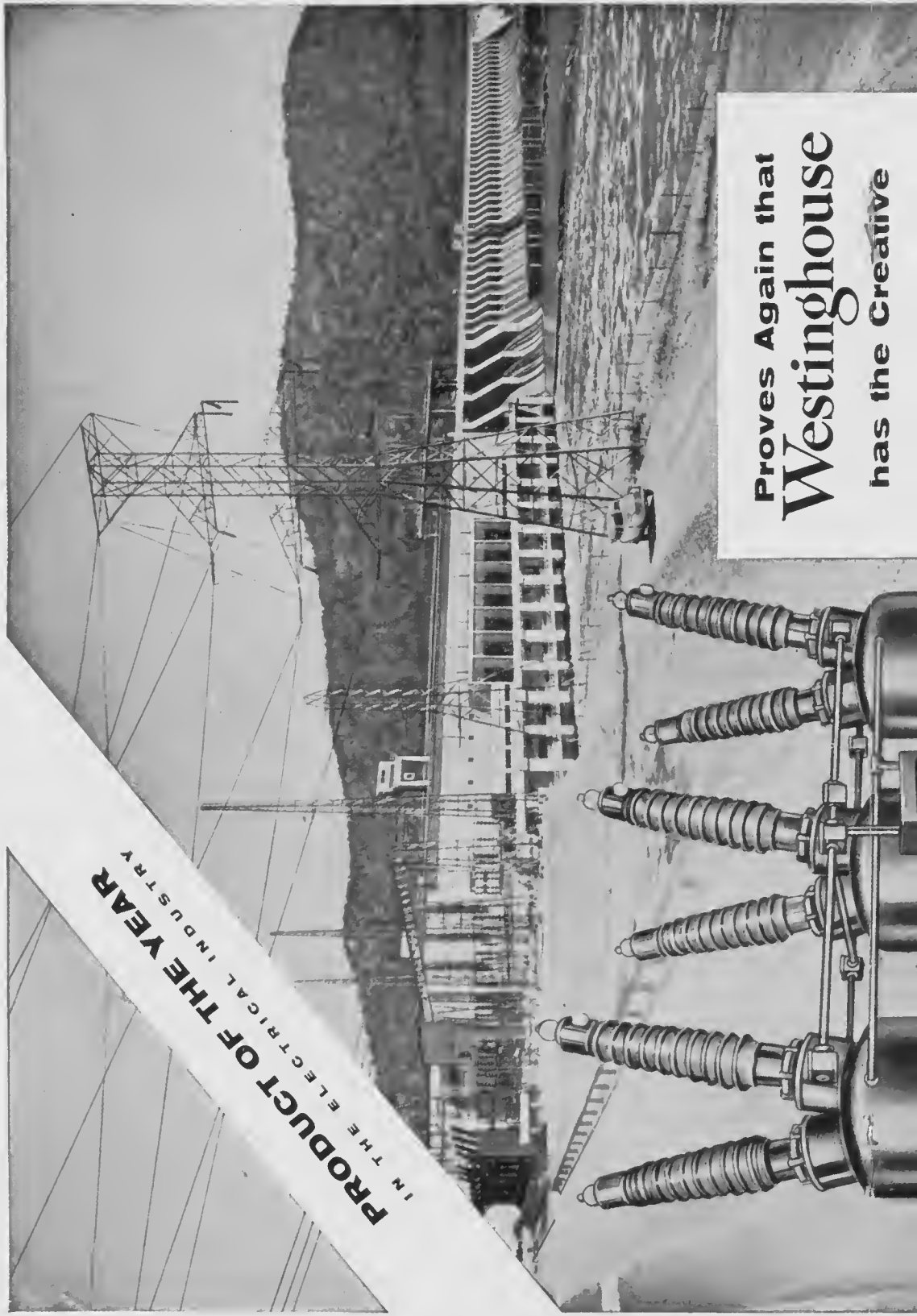
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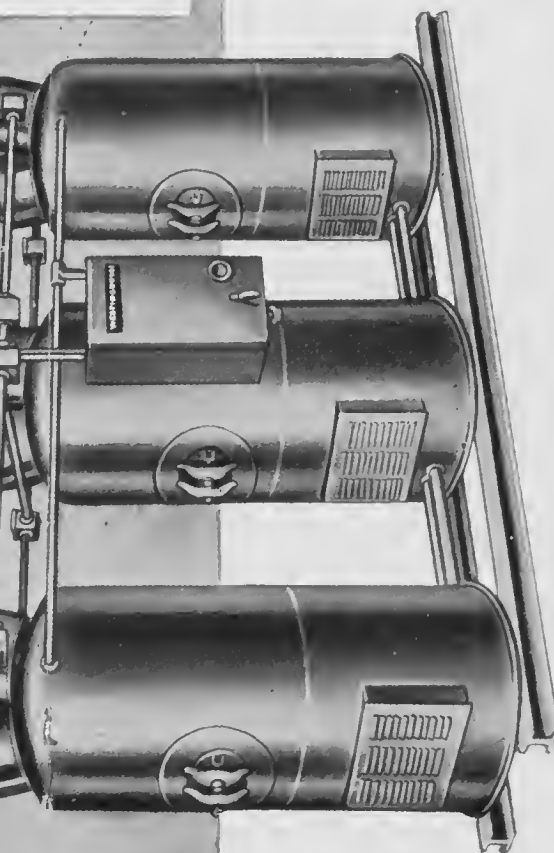


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A Few Words from the Stick

AS ANOTHER YEAR draws to a close I believe we can say the Engineers have again set an enviable record of achievement on the campus.

Recognition should be given the fellows who brought Engineering its first Freshman Parade Float Trophy and those responsible for entering our first participation in Varsity Varieties. These I mention only because they are additions to the activities promoted by the UMES and illustrate Engineering's ability to be winners in any field.

As usual, there are too few carrying the ball in most of our activities. Many of us declare we are too busy with a rough course to participate in any extra-curricular activity. Little do we realize how valuable some participation is in obtaining a well-rounded university life, and also in preparing for postgraduate positions.

I would like to extend my thanks to the fellows who have contributed so much of their time and energy this year in keeping the forty beermen out front.

To the UMES and its council of next year, I wish you every success.

DON CRAIK,
Senior Stick of Engineering.

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An Aspiration

THE UNIVERSITY OF MANITOBA RADIO STATION

By MARK F. MACPHERSON, IV E,
Chairman, U.M.S.U. Radio

FOR the past three years, on the campus of the University of Manitoba, a group of engineering students have been engaged in the construction of a radio station. These students are members of an organization known as U.M.S.U. Radio.

U.M.S.U. Radio is a committee of the U.M.S.U. that is mainly responsible for the production of radio programmes featuring university student talent. Many students feel that we are responsible only for the noise in the cafeteria during lunch-hour. Nevertheless, to keep our name clear, we feel that our other activities should be brought to your attention. The committee is composed of approximately 180 students, 50 per cent of whom are engineers. The engineers working on this committee are engaged in public address operations at dances, games, fraternity functions, Glee Club productions and Varsity Varieties. They are also designing, building and maintaining electronic equipment. In the past two years engineers have



*Inside the new recording studio.
Barry Wilson at the control panel.*

designed and built four brand new public address amplifiers for the U.M.S.U.

The largest project undertaken by students—that is all students for all time—is the construction of a radio station. This project was started in 1953 and was initiated by Mr. Don Campbell, IV E, who was chairman at that time. The Administration of the University co-operated with the committee and allotted space on the fifth floor of the Administration Building, alias the “Pagoda.” This room, at the outset, contained six-inch vents for toilets on the fourth floor, several lengths of 6' x 4' air-conditioning ducts, several large holes, some old lighting fixtures, four charcoal ovens belonging to the School of Agriculture, and was generally a depressing sight.

In 1953 there was no money available for this project. Throughout the Spring of 1954 plans were begun and the summer was spent cleaning out the room. About this time the CBC donated nearly all of their old studio

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equipment, including a very fine RCA console, vintage 1934. During the session 1954-55 plans were drawn up and the committee started to investigate the possibilities of obtaining money. The Brewers and Hotelkeepers Association donated \$1,000.00; \$1,200.00 was raised by public subscription, \$900.00 donated by the Surplus Fund Board of the U.M.S.U., and the Alumni Association donated a piano. This meant a complete working radio studio was to be constructed for \$3,000.00. This is actually impossible to do, and therefore the engineers had to rise to the occasion and help construct a studio. During the summer construction was commenced and by the fall the project was nearly completed. During the fall and winter of 1955-56 engineering students spent a good amount of their time on the fifth floor of the Administration Building, and by February the studio and control room were completed.

This studio is to be used for the production of radio programmes. The Radio Committee has obtained a professional quality tape recorder and at present has two radio series on the air, consisting of 13 one-half hour programmes on a total of five radio stations in Manitoba and Saskatchewan. Work with the Radio Committee has proved beneficial to most students concerned, as no one is particularly overworked and the students are being introduced to the problems pertaining to broadcast operations and equipment as well as the limitations of public address systems.

Three students in the past two years have had their theses sponsored by the Radio Committee. This proved a great benefit to both the students concerned and the committee itself. Mr. Don Hadden, who graduated last year, wrote his thesis on a broadcast console, which won the Manitoba Telephone System prize.

The next question that arises is that of the future of this project. That is answered by the title of this article. The next step is the installation of the necessary equipment required to convert the existing recording studio into a radio broadcasting station. Steps to this end have already been taken. A local radio station has tentatively offered a 250-watt A.M. transmitter free, along with some additional studio equipment. Another radio station has been considering donating some recording equipment and microphones. The University has loaned to the Radio Committee spare lines from the telephone exchange to the buildings on campus in order to facilitate remote broadcasts of campus events. Some of these lines are presently in

use, carrying noon hour music from the studio to the UMSU cafeteria. This activity gives the people involved the feel of a real broadcast.

The regulations of the Department of Transport provide for the establishment of non-commercial broadcasting stations for educational purposes at a nominal fee for the license.

Thus it can be seen that a radio station on campus is feasible both legally and financially from an equipment point of view. Once a station is established, programmes must go on the air. The main bulk of the proposed programming would be a disc-jockey type of show, supplemented by "productions" such as musical variety and recitals (like those presently aired by other stations), campus news, sports events, special events like convocations, as well as talks and interviews. For the first few years broadcasting would be on a limited time basis involving evenings on weekends except on special occasions.

In retrospect, a radio station at the University of Manitoba is not only practical but very probable in the foreseeable future. As this article started with history, it will end with a prediction—that the voice of the University of Manitoba will be well known around the province in another few years.

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*Dr. Austin Wright's
presentation to Senior stick
Don Craik.*



*Former Dean Fetherstonhaugh with present
and past E.I.C. presidents, R. E. Heartz
and D. M. Stephens.*



*John Moore receives the
E.I.C. award from
Dr. Heartz.*

The Student Section of the Engineering Institute of Canada

By

LEO PAQUIN, Section Chairman

AS the term draws to a close, we all begin to worry about the sword hanging over our heads—Exams! The glory of the student—or his downfall! If we have done our work, fine; if we have not, well—

As you all know, the S.E.I.C. is an organization of the students, administered by the students for the benefit of the students. The Institute's purpose is to instill in the student the fact that Engineering is an important profession, to himself and to society; the Institute is a tool for disseminating knowledge to all who are willing to develop their minds and broaden their power of thought. Ultimately the Institute thrives on co-operation, hence we can say "One for all and all for one." If we have, in any way, made you aware of these facts during the year, our efforts have not been in vain.

In reminiscence, let us enumerate a few of the highlights of the year. You may well recall our first films and your first encounter of the S.E.I.C., especially those short appeals urging you to become a student member of our organization; believe us those appeals were not in vain, as our enrollment has so well proven.

We have enrolled ninety new members this year to bring our total membership to 165; the fourth year Mechanicals are to be commended for their success in achieving a 100% membership in the S.E.I.C., with the fourth year Civils a close second. The success of this membership campaign was due largely to the efforts of the class representatives of all year. Congratulations, gentlemen, and carry on the good work in the year to come.

Our former chairman, Bob Gair, should not go by unnoticed. Bob was just getting things going nicely when, in November, he was forced by an untimely illness to relinquish his post in favour of his more pressing studies. But Bob did not retire completely; thanks to him and to members of the Engineering staff, through the courtesy of the R.C.A.F., a Rolls-Royce Nene Turbo-jet engine was on display in our Mechanical Engineering Lab. Thank you, Bob, and good luck as a "bushman."

On November 29, 1955, our guest speaker was Mr. J. H. Parkin, Director of the Mechanical Division of the National Research Council; his talk and film on the work of his division were interesting and informative. His appeal for Engineers reassured us that

our future in this chosen field was quite secure.

The following week our student branch was honoured by the presence of the National President of the E.I.C., Dr. R. E. Heartz, who gave a most interesting lecture, which was followed by the conferring of the E.I.C. award to John Moore, of Geol. IV. At this time Mr. Austin Wright, general secretary of the E.I.C., presented the "Austin Wright Memorial," in the form of a slide rule tiepin, to our Senior Stick, Don Craik, for his outstanding efforts in student affairs.

Yes, the U. of M. S.E.I.C. has had a busy year; more than twenty-five films, on subjects varying from "A" bombs to model "T"s, were shown to capacity attendances; the membership campaign has put our branch near top place in student members for universities across Canada.

"So you're going to be an Engineer," is the title of a booklet which was circulated among the students during the term, and which is well worth reading; it outlines the value of the E.I.C. to a young engineer, the advantages of becoming a student member, and the possible prestige that comes with being a member, if you wish to take advantage of it. Let us put it this way, the Institute is there to help the student in many ways; for example, awards, loans and a library of over 15,000 volumes, all of these are yours for the asking.

To all those who have in any way helped us make this past year a success, we extend our sincere thanks, in particular to our own Dean Macdonald, who was always ready to co-operate, and to Tom White, who was always so willing to donate his time as a projectionist.

In concluding, we would like to bring to the attention of those we are leaving behind these words of advice which were so well

put by Dr. Smith, President of the University of Toronto, in his address to the students of that University on September 21, 1955:

"You have freedom of choice, and by inescapable equations your choices will bring you profit or loss. If you choose to work, you will pass; if you don't, you will fail. If you neglect your work, you will dislike it; if you do it well, you will enjoy it. If you join little cliques, you will be self-satisfied; if you make friends widely, you will be interesting. If you act like a boor, you will be despised; if you act like a human being, you will be respected. If you spurn wisdom, wise people will spurn you; if you seek wisdom, they will seek you. If you adopt a pose of boredom, you will be a bore; if you show vitality, you will be alive. If you spend your free time playing bridge, you will be a good bridge player; if you spend it reading, discussing and thinking of things that matter, you will be an educated person."

"If you have come here for social prestige, you can get what you are after, but you may not like it much when you have got it; you would really have done better to concentrate on debutantes' parties. If you have come here to learn to make money, you can get what you are after, but you run the risk of finding yourself unhappy in your goal; you would really have done better to get into the building trades or the stock market. If you have come here to be a personality kid and win friends and influence people, you might get what you are after, but it would have been quicker and cheaper to take a course in salesmanship. If you have come here to learn to serve your fellowmen as a member of one of the learned professions you are in the right place. If you have come to study the most important ideas that mankind has evolved, you are in the right place. If you have come to penetrate the fascinating mysteries and powers of nature, you are in the right place. If you have come to learn of the cultural and intellectual heritage of the past, so as to stand on the giant's shoulders and see farther, 'to follow knowledge, like a shining star, beyond the utmost bound of human thought,' you are in the right place. You may never get what you are after, but in trying you will become what you could never otherwise have been, and these next few years that you spend here will be the keystone of the arch of your experience."

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AS IN previous years the students of the faculty of Engineering have made the year 1955-56 a successful one for the Engineers in sports. The spirit which binds the faculty of Engineering together was evident in most of the sports.

Engineers have succeeded in winning the Intramural Sports Trophy for the past four years and have also had a monopoly on the volleyball trophy ever since its inception some nine years ago. This year, however, the Engineers are being hard pushed in the race for the trophy by their old rivals, Agriculture. At present, the point standings of these two teams are nearly the same. Also, this year, the Engineers' domination of volleyball has been challenged by a team from Science.

The Engineers started off the 1955-56 year by capturing the team championship in the University golf tournament. Members of the victorious team were, golf convenor Al Abbott, Don Peach, Bryan Weir and Gord Crabtree.

The Track and Tabloid event, which was won by Engineers last year, this year was won by Science. However the Beermen captured the team event in the annual four-mile road race. Members of the winning team were Ed Debusschere, R. Korchynski and Don Drybourgh.



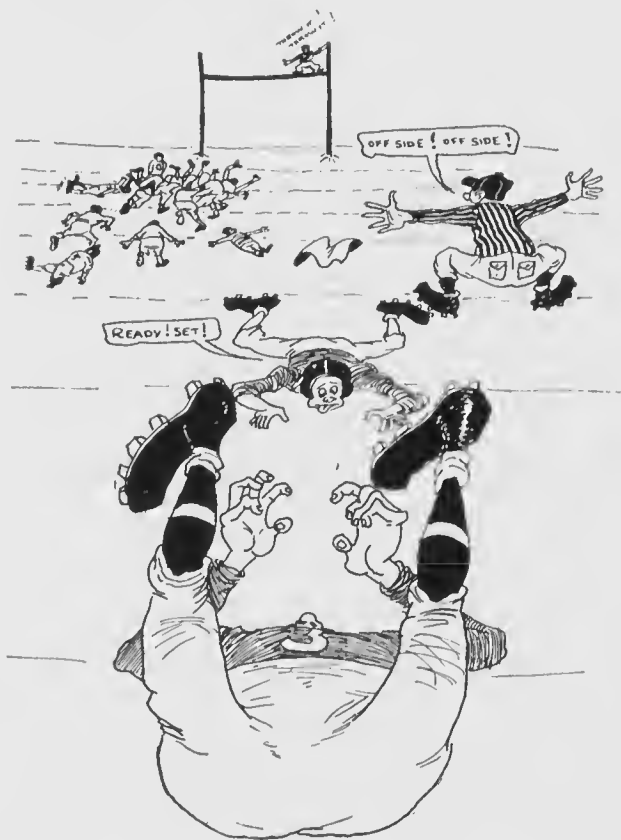
Champion Senior Soccer Team, 1955-56

BACK ROW: *Bruce Walker, Kaz Swiderski, Ron Fisher, Hugh Krentz, Bill Legiec, Bob Hansell, Ihor Diakunchak.*

FRONT ROW: *Steve Gaillard, Johnnie, Gatschuff, Ed Dolhun.*

ENGINEERS

By GARY THOMPSON



Engineers staged a comeback in six-man football this year, after a dismal season last year. Engineers, under the capable guidance of Bruce Leibrock, won their division easily, but were beaten on a snow-covered field in the final by United College. The Engineering team was led by a first-year quarterback, Dave Mitchell. Other members of the team were team captain Gary "Dad" Thompson, Al Abbott, Don McLean, Gerry Kendall, Dennis Sigurdson, Bill Breakey, Tom Ferens, Bill Aspinall, Bob Zimmerman, Gary Swan, Wayne Starr and Alec Robertson.

Last year's championship senior soccer team retained its supremacy in its league this year by going through the schedule undefeated. Outstanding soccer players such as Bob Hansell, Hugh Krentz, Bill Legiec, Kaz Swiderski and soccer convenor George Dyck sparked the team to victory. Other members of the squad were: J. Gatschuff, S. Gaillard, E. Dolhun, B. Walker, W. Kudrik, R. Fisher, and I. Diakunchak. Other Engineering soccer teams did not fare as well except for one junior team which made their division final.

For the first time in nine years, Engineering was defeated in the Volleyball championship. Science I beat Engineering I, two games to one in a best-of-three final. Members of the Engineering I team were: Bob Gair and Bill Legiee, co-convenors of volleyball, Ed Dolhun, Kaz Swiderski, Rieh Verner, Johnnie Gatschuff, Orest Chaykowski and B. I. Sehulakewyeh.

The Engineers won their fourth consecutive swim meet this year, with over half of last year's winning team, including such stalwarts as Bill Legiee, Frank McGregor and Len Morhalo, back to compete again.

The senior basketball championship was captured by Engineering I for the second consecutive time this year when they defeated Medicine in two straight games. The team was led to victory by returnees Trev Fraser and Bernie Shukster, with ample support from Ed Dolhun, Jack Klein, Rube Diamond and Don Johnston. An Engineering team was defeated by Science in the Junior division.

IN SPORTS

AND DOUG MCKENZIE

Men's Rifle Team Champs, University of Manitoba, 1955-56, Warren Purdie, Lorne Beatty, Reg Tansony, Art Lobel.



*Dave Thompson,
Men's
Badminton
Champ,
U. of M.,
1955-56.*



*Ron
Peiree,
Men's
Ski
Champion,
U. of M.,
1955-56.*

Rifle convenor Reg Tansony reports that the Engineers won the intramural rifle competition this year as well as the C.O.T.C. trophy. Marksmen he counted on included Art Lobel, Lorne Beatty, and Warren Purdie.

Led by curling convenor Norm Houck, the Engineers are still in the running for the Intramural curling event.

In hockey, Engineering has placed one senior team and one junior team in the playoffs. Both of these teams could very easily win their respective titles. Some of the keener hockey enthusiasts are: Al Abbott, Doug McKenzie, Bill MeQuay, Ed Polloek, Bill Kent, Glen Morris, Frank Armstrong, Jim Nykoluk, and Bruce Hamilton.

The Engineers' awards banquet was held at the Marlborough on March 8, this year. Bob Gair received the Engineering trophy as the year's outstanding athlete. Gary Thompson also received a trophy for his work as Athletic Chairman.

Looking back over the past year's record of the Engineers in sport, we can see that they have done very well for themselves and if they should happen to miss out on winning the Intramural Sports Trophy, it will not be due to lack of effort.



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Miss Marilyn Abram

POWER PROM QUEEN
OF 1956

Engineers' Social Calendar

By LARRY HURWITZ, IV C.E.



The Engineers' prize-winning float in the annual Freshie Parade.

FRESHIE WEEK

In 1954 it fell apart; in 1955 no one knew what it was; but in 1956, under the able chairmanship of Brian Akins, the U.M.E.S. Freshie Week committee gained a distinction never before attained by their predecessors. The Engineers captured the float trophy. The float depicted a hydro-electric dam and power station supplying power through transmission lines to a colorfully lighted "E." Mary Ross was chosen from several capable candidates to represent Engineering in the race for Freshie Queen.

FRESHMAN RECEPTION

The annual Freshie banquet and dance was held October 5 in the Blue Room of the Marlborough Hotel. Following a turkey dinner, students heard addresses by the Dean, the senior stick, the athletic president, the social chairman, and the guest speaker, Prof. Clark Hopper. Prof. Hopper, who retired from the English Department last year, returned to his old haunts to deliver a most

enjoyable after dinner speech on the topic of "Freshmen."

The dance following the banquet was well attended by both Home-Eccers and Engineers, and couples danced away the evening to the scintillating rhythm of Sextet 75.

STAG

Due to circumstances beyond control, the annual Engineers' stag had to be cancelled. However, an impromptu stag was held early this year in honor of two upper classmen who will soon be hearing wedding bells. The stag drew a large attendance from the faculty, as well as the many personal friends these boys have. Due to an unseasonable warm spell, all of last year's personalities could not attend the affair. Entertainment was provided by Dave MacIntosh, his pogo stick and his western group, Berks Baker, Ron Kruger and Warren Purdy. During the course of the evening awards were presented to several Engineers who had worked on a recent fluid research project.

Six campus beauties —

Jane Clipsham, Margaret Grant, Terry Benson, Nancy Brown, Suzanne Flood, and Power Prom Queen, Marilyn Abram.

Prof. G. A. Russell is Dave McIntosh's new pogo stick protege.

Marilyn Abram is congratulated by last year's Queen, Alene Jackson.





Senior Stick Don Craik takes a joyride with Mary Ross, Engineers' Freshie Queen.



Barry McKenzie presents the float trophy to Don Craik.

THE POWER PROM OF 1956

Despite a medical plot to kidnap the queens and a grand march of several feathered fowl, the twenty-sixth annual Power Prom, held on February 10, proved to be the highlight of the Engineers social year. The Engineering Fraternity, Sigma Phi Delta, had the Crystal Ballroom of the Royal Alexandra Hotel decorated at its best. White and brown were emphasized in the decorations, which included a large "E" revolving in gears, a light organ, and two massive hydro towers supporting uncountable balloons.

Six campus beauties, representing six sections of Engineering, vied for the coveted title of Power Prom Queen. They were:

First Year—Terry Benson, St. Mary's;

Second Year—Marilyn Abram, Home Economics;

Civil—Nancy Brown, Arts;

Electrical & Engineering Physics—Suzanne Flood, Interior Design;

Geological—Jane Clipsham, Science;

Mechanical—Margaret Grant, United.

The festive Crystal Ballroom of the Royal Alexandra Hotel, scene of the Power Prom for 1956.



Prior to the dance a gala reception was held in the Windsor Room. The queens and their escorts and the faculty and their wives were entertained by the U.M.E.S. council. Faculty guests included many professors from Arts and Science who lecture to the Engineers.

Irvin Plumm's orchestra was in attendance and supplied an abundance of fine dance music for the capacity crowd of enthusiastic Engineers and their girls. Intermission entertainment featured a female vocal group, The Newtones, along with Dave MacIntosh and his pogo stick. Dave later turned impresario and introduced a new master of the pogo stick, Prof. G. A. Russell.

A hush drew over the audience as senior stick Don Craik introduced Dean A. E. Macdonald, who held the news everyone was waiting for. Representing a panel of judges, consisting of himself, Prof. R. E. Chant, Prof. G. A. Russell, and senior stick Don Craik, Dr. Macdonald announced that Marilyn Abram was Miss Power Prom of '56, and presented her with the symbolic beer mug.

AWARDS BANQUET

Presentation of awards for athletic proficiency and for distinction in social, dramatic, and other fields was made at the annual awards banquet held this year in the mezzanine dining-room of the Marlborough Hotel on March 8. The executive council of the U.M.E.S. received special awards, which will remain keepsakes for many years to come.

GRADUATES FAREWELL

The class of '56 made the most of the evening dedicated to themselves. On March 16, at the Royal Alex., the outgoing Engineers dined and danced away the last of those fine four years. Presentation of beer mugs was made to each graduate. After a memorable evening at the Alex., one and all adjourned to the Club Morocco, where the graduates watched the night turn into day.

A Labour



Opener: "His name is Sky--High Noon."



"Mr. Slade, you just gotta give mah daddy more time to pay that little ole mortgage."



"Alright Slade, scrath fer yore smoke-pole!"



"Tell—mah mother ah died — with mah — boots — on — (choke)."



"Charity honey, there's just one question ah gotta ask ya."



Ken Layton, trumpet
Ernie Pashniak, bass horn
John Moore, barophone
John Woods, clarinet
Warren Purdie, banjo
Don Francis, piano

Varsity Varieties

By

JOHN MOORE, IV G.E.

HISTORY was made in Varsity Varieties of 1956 when Engineering was featured for the first time, presenting a colossal epic entitled "Lust in the Dust."

Under the able direction of Ken Weisz, Drama Chairman, work was begun in December on an entry in the inter-faculty skit competition. A satire of the western movie was decided on, consistent with the VV theme, "A History of Show Business," and VV director Izzy Asper was quick to see the possibilities of the idea.

After Christmas the script was improved, staging was arranged, and sets were begun. Jim Speirs and his guitar opened the production, singing "The Ballad of Sky-High Noon." Cast in lead parts were Ken Dawson as Sky-High Noon, shining hero; John Woods as the villain Slade; and Alison Day as sweet, innocent Charity Goodheart. Ken Bailey was featured as the Sheriff in a memorable death scene. Slade's vile-looking gunslingers were Ron Kruger, Jim Nykoluk, Ernie Hnatiuk, and Jack Norman. Jack Lange was a convincing janitor, Ken Weisz the retiring representative of Ripley's *Believe It or Not* ("We didn't believe that the Engineers could get a skit in Varsity Varieties"), and John Moore the Yale-educated bartender. Sky-High's lovable hoss Zipper was (from front to rear) Don Drybrough and Don Kasianchuk.

The stage sets were a masterpiece. Pete Abel, Jim Fulford and Bruce Rea produced swinging doors, a gypsy caravan, a bar to suit the oldest stony, and the traditional nude portrait—ten feet long.

The performances, February 16 and 17, were an overwhelming success. Seven people and countless blank cartridges bit the dust every night, and the audience couldn't stop laughing. Credit must be given here to Ted Ottley, who, though not fortunate enough to be an Engineer, gave his all to the background barroom piano.

Critical acclaim was soon forthcoming. Skit adjudicators commended the acting as "brilliant," the satire as "near perfect." Looking for a celebration, the cast travelled to Saskatoon that weekend, and made an even greater impression on the students there.

Engineers were the mainstay of several other acts in VV. Martin Tennenbaum took part in *Slaughter on Tenth Avenue* production, and, in the Imperial Band of the *Basin Street* feature, four of the six musicians—i.e., John Woods, Ernie Pashniak, Warren Purdie and John Moore—were Engineers.

Said Ken Weisz, after the applause had ceased: "Next year we're doing *Peter Pan*. We can get all the fairies we'll need from the Medicals."

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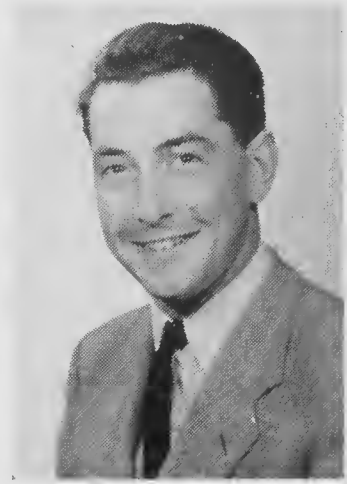
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Our Mechanical Senior Stick

DONALD W. CRAIK

Senior Stick of Engineering, whose hometown is Greenway, Man. Don attends regular meetings at the Pioneer Athletic and Pembina Clubs, and participates in curling, golfing, badminton and bowling. He came to Engineering via United College and Pharmacy, and is planning a future in gas turbines. A married man of long standing.

Civil Graduates

ALISON G. ABBOTT

"Al" or "Ab" is primarily known for his unorthodox haircuts, red-blond beard, matching toque, and his roly-poly shape. Usually observed chatting in the back row with "UMSU" and "Jake." A brilliant student—he claims homework is non-existent. Hockey and badminton enthusiast. Ambition: To invent a "Straight-C" machine.

BRIAN E. AKINS

Graduate of Gordon Bell High School. Brian has been active in council work in all four years of Engineering. As this year's Freshie Chairman, he distinguished himself by bringing the float trophy to the faculty for the first time. Ambition: To build them bigger than Ernie.

THOMAS L. BLAIS

A St. Vital man, Larry is the "Grand-dad" of the class. A former "Navy Man," probably the most travelled member of the class. A happy-go-lucky guy, who is scholastically one of the top men. Sports: golf, fishing, watching hockey and basketball games. Future: Fisheries inspector.

ARNOLD BOOKBINDER -

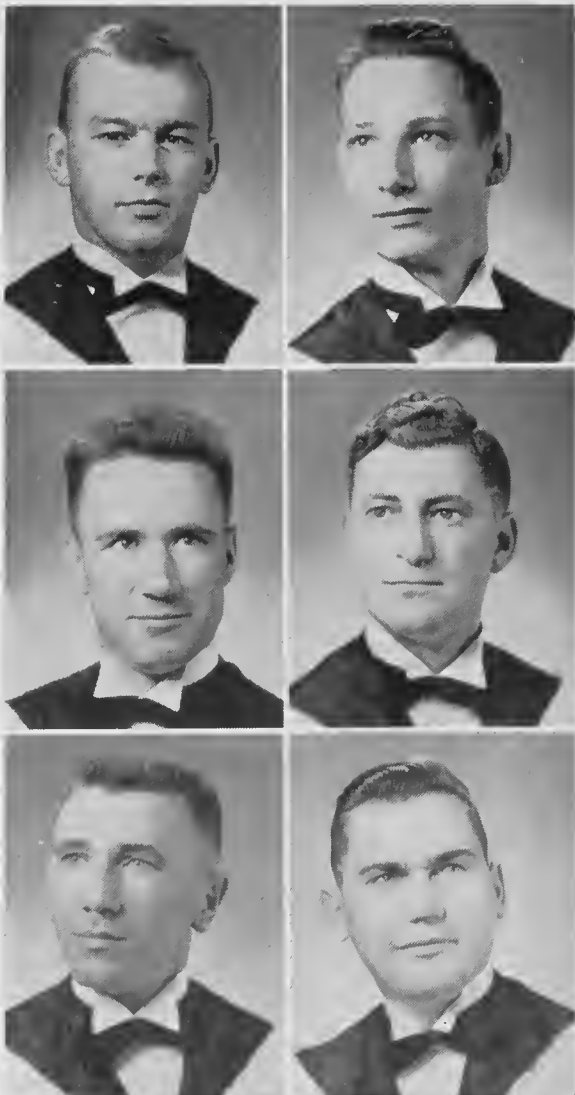
"Bookie" is the best fed and yet, strangely, the thinnest man in the class. When he passes out his wife's delicacies a riot generally occurs. A former Army man, he recently received the "Royal Canadian Engineers Memorial Scholarship" to add to his already high scholastic standing. Future: Unpredictable but successful.

MYROSLAV CORKAL

From Fraserwood, Manitoba, "Mers" is a very conscientious worker and an avid sport enthusiast; participated in hockey, curling and soccer. Member of Gamma Rho Kappa. "Mers" has spent the last five summers with the Dept. of Transport at Gimli; and has a keen interest in Construction. Hobbies: "Hunting" a certain girl in his "Dodge."

HAROLD DALKIE

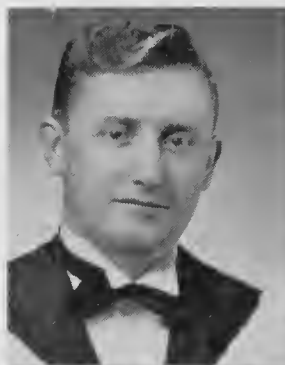
"Hal's" ideal is to get his assignments in before anyone else, obtain exceptional marks in exams, have time to be a member of the Engineering Council, and play "pro" hockey three nights a week (at Minnedosa yet!). Future: "Julie," and Design with Cowin Steel.



Civil Graduates

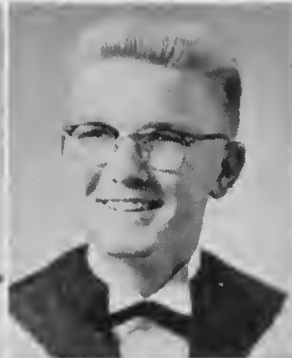
DOUGLAS R. DAWSON

"Doug's" amiable manner and pleasant smile can overcome even the sternest professor. This hard-working student from Portage la Prairie can curl a mean rock. Doug has done quite a bit of travelling, as he worked with the Dept. of Transport during the summers. Hobbies: Photography.



EDWARD DOLHUN

Ed. never believes in leisure time—be it sports, studies, or Council work. B. & G. rep., Gamma Rho Kappa, and S.E.I.C. Winner of American Society of Metals Award. Usually heard telling jokes, "in other words —"

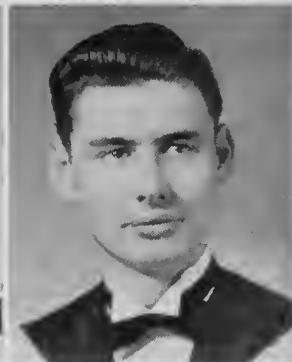
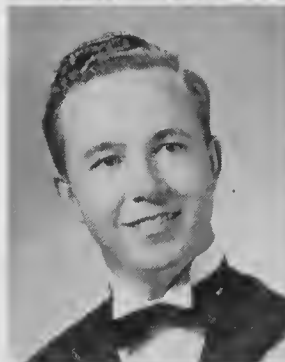


CHARLES FEUER

If silence is golden, Charlie must own Fort Knox. Can always be seen comparing notes with Lee. A jazzy dancer, so girls beware when he starts his routine with "Wal, it was like this —". Ambition: To get his B.Sc. in C.E., and to prove studying is only a figment of the imagination.

ROBERT A. HEWETT

The Fort Whyte boy has a smile and thought (kind or otherwise) for all students and professors. His infectious grin has warmed the hearts of his classmates on many a dull and gloomy day. An outstanding student and sport enthusiast, Bob should be successful in whatever he undertakes.

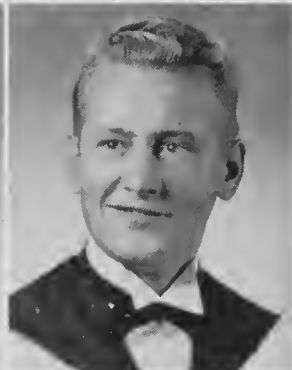
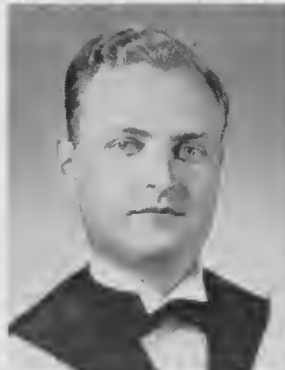


DAVID HOLLOWAY

"Pappy"—the head of a family out in Charleswood, is the steady influence of the class. A conscientious student, but claims he doesn't speak the same "Soils" as Prof. Baracos does. Noted for his careful taxi driving, giant sandwiches, and controlled temper. Member of the S.E.I.C. Dave's future lies with the C.N.R.

ALVIN G. HOOK

"Al" lives in Elmwood, and it is from here that he commutes to and from University, showing either a thirst for excitement or possession of steel nerves by riding in Priestley's "Flying Jeepster." He is addicted to bridge, curling, reading, and getting into mischief. Future: Postgrad?

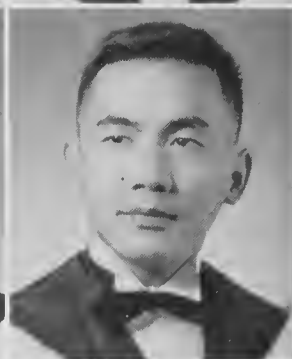
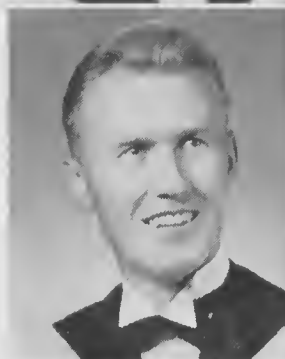


LARRY E. HURWITZ

When he works—he works; when he plays—he plays; when he does neither he counts pennies. His activities as UMES social chairman take a lot of time, but meticulous Larry still manages a high scholastic standing. He intends to take his M.Sc. (C.E.) at M.I.T.

ENN KAARSOO

A warm friendly nature makes Enn everybody's friend. He loves beer, parties and people. He is the originator of the famous "Kaarsoo Empirical Method." Favourite saying: "Smile, boys—I don't know how, but the work always gets done."



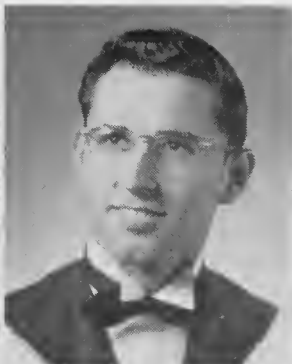
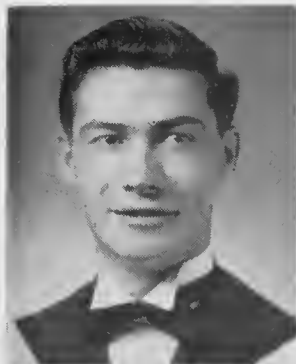
RUDY W. KORNELSEN

Rudy, our blond intellect, hails from Coaldale, Alberta. His conscientious study brings fruitful rewards in that he has taken almost all of the available scholarships—McKechnie Memorial, California Standard, and 3rd year Isbister Scholarships. An extremely popular fellow who should succeed in any enterprise he undertakes. Future: Design.

RICHARD LEE

All the way from Hong Kong, China, "Rich" is the inventor of the "Lee Bilingual Structure's Theory," which no one has disputed yet; also part-time philosopher, as he warns his classmates that—"When the candles are out, all women are fair." Favourite expression: "And so to bed." Future: Postgrad work in structures.

Civil Graduates

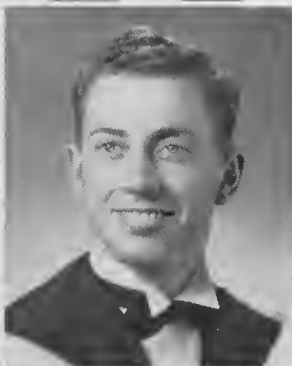


ANGUS A. MACLEOD

Angus is the man whose characteristics consist of the three C's—cool, calm, and collected. He calls Morris, Manitoba, his home. Has high hopes of organizing a raid on the Women's Residence. He will probably go places as he has the wanderlust in his eyes.

THOMAS MAFTECHUK

Tom is the curling and bowling master of our class. He has skipped his ring to the semi-finals time and time again. Can always be seen trying to devise a way to simplify homework (usually succeeds). A diligent student who will no doubt prosper.

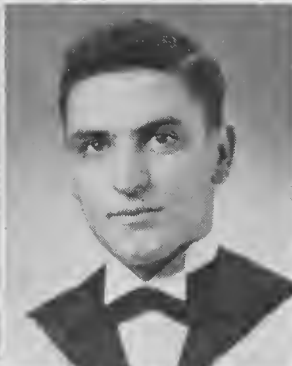


CLYDE R. MCBAIN

Clyde seems to have cornered the athletic awards, as he is now working on his second Engineering sweater, by participating in curling, soccer, bowling and volleyball. Very seldom sits still, can usually be seen scurrying to or from somewhere. Future: Extremely bright.

LLOYD R. MCGINNIS

"Toad," a former native of The Pas, now of Selkirk, is the smallest man in the class. However, he makes up with agility and knowledge what he lacks in size. A holder of the Manitoba Brewers and Hotelkeepers Association Scholarship, and also the M.H.B.A. bursary. Married. Lloyd's future lies with the C.N.R.



WILLIAM MINUK

A Winnipeg product who has an affinity for car operas, Bill claims that "the wheel that squeaks the loudest is the one that gets the grease." He can usually be seen arguing with Hal on the merits of "Herculite" concrete.

GLENN A. MORRIS

Glenn is a top athlete as well as a top-ranking student from Austin, Manitoba. Participating in hockey, badminton, basketball, soccer and rifle, he still has had time to obtain his share of the scholastic honours, namely, the 3rd year Isbister, throughout his stay at "U." Future: Postgrad.

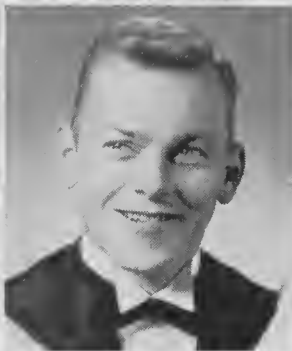


JOHN D. NORMAN

All the way from Birch River, Manitoba, "Jake" is 4th year Civil's organizer of extra-curricular activities, manager of "Jack Norman Enterprises," member of Sigma Lambda Phi Frat., and a R.C.N. Reserve officer (U.N.T.D. Graduate). Participated in both inter-fac hockey and curling. Winner of 1955 Summer Thesis Award.

JOHN S. PAULSEN

John, or "Tanker," is from Whitemouth, Manitoba, and is active in all sports—curling, bowling and hockey. Recently engaged (what a way to go!). An exceptional student—as often as he attends classes. Future: Municipal engineering.



ALLAN PRIESTLEY

This ambitious young fellow is noted particularly for the many exploits with his "Jeepster." A member of Sigma Phi Delta Frat., and also the Executive Committee of "The Older Boys' Parliament Association." Holder of a 3rd year Isbister Scholarship. Ambition: To build bigger and better bridges.

TERRY A. WILLIAMS

Known as "UMSU" because of his affiliations with the Student Union building. Terry is destined for an illustrious career in the R.C.A.F. since he is equally adept at "scrambling" in a jet plane or a Morris Minor. Favourite quote: "After the coffee, things ain't so bad."

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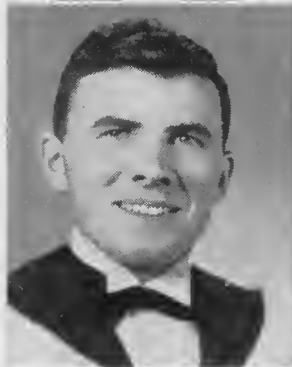


Electrical Graduates



WILLIAM ANHANG

Forsook Arts to advance Engineering. Meddler in many occult arts. Renowned authority on rooster presentation. Member emeritus of Society of Ancient Frothblowers. Intends to see world ere annihilation, or at least before succumbing to ease and money.

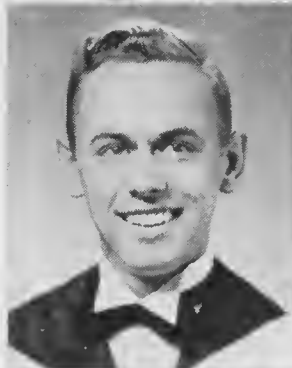


JACK A. BOHAY

Activities: Photography, model aircraft, classical record collecting. Also a boatsman, hunter, fisherman. Has tended bar but teetotals. Success predicted.

EDWARD P. DEBUSSCHERE

A former school teacher. Hometown: Haywood, Manitoba. Has excelled in track and likes basketball and soccer. Social chairman of Newman Club. Remaining in the province and assuming family duties.

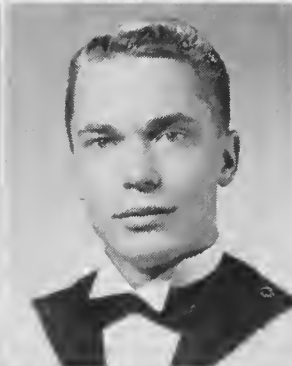


MURRAY V. DUFFIN

Activities: Soccer, volleyball, UMSU radio. Pragmatic, shrewd thinker, versatile conversationalist, amused observer of the human comedy. Has seen Europe and North Africa. Going to Eastern Canada. Prospects for future should not be belittled.

GERHARD DYCK

Varsity fencing, intramural soccer, volleyball, track and field. Career lies with City Hydro, Winnipeg.

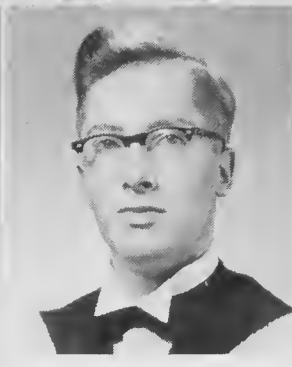
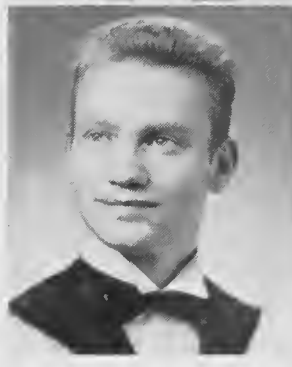


MERVIN ENDERS

Hometown: Beardmore, Ontario. Began Engineering at Lakehead Technical Institute, completed at U of M. Studious and reserved. Sports interests: basketball, soccer, hockey. Future with Ontario Hydro.

CHRISTOPHER GILLESPIE

Summers at CBC and/or Kenora. Member of UMSU Radio (1, 2, 3, 4), stage manager of French plays (1, 3, 4) and Chancellor of the Ancient Frothblowers (*in aeternam floreat*). Hobbies: boating, shooting, vintage research (advanced). Ambition: to prosper and retire. Meanwhile bears burden of Athlone Fellowship (1956).



GEORGE N. GOOSSEN

Hometown: Steinbach, Manitoba. Radio experience wide and possessor of amateur licence. Future lies in Winnipeg and tendencies are toward settling.

DONALD M. HEYS

Activities: UMSU Radio (1, 2, 3). Alias "UMSU Heys." Passed many a course without attending a class. Member IRE and Ancient Society of Frothblowers (bubble baths a specialty).

BRUCE M. JACOBS

Hometown: Darlingford, Manitoba. A quiet, conscientious man. Skier, curler and gentleman farmer. One-time holder of a Brewers and Hotelkeepers Scholarship. Future uncertain. No inclination to migrate.

Electrical Graduates

MARK F. MACPHERSON

Activities: UMSU Radio (2, 3, 4), its Chairman 1955-6. Instigator of new studio in Administration Building. Originally from Ontario, has attended Queen's and served with the army. Future: marriage imminent.

GERALD MANCHUR

Hometown: Tyndall, Manitoba. An excellent scholar and power man by choice. Member of Ukrainian Youth Association. Interests in hockey, football, matrices. Future: design with Ontario Hydro.

IRVING A. NATTRESS

From Port Arthur. Extensive social activity. Has succeeded in becoming a manifold enigma due to seemingly encyclopedic knowledge. Extensive railroad experience. Future rates an A.

RONALD J. NAWROCKY

A diligent, conscientious man whose work is meticulous. Member of Gamma Rho Kappa and TUSM. Interests are in volleyball, water sports. His driving ambition to become a good engineer ensures him of success.

DONALD R. PEACH

University golf champion 1954-5, active in badminton and tennis. Winner of Manitoba Brewers and Hotel-keepers Scholarship. Extremely likable fellow whose success will come early. Future with Dupont.

BJORN O. PEDERSON

His nonchalant and easy attitude disguises one of the most active minds in the department. His academic achievements make him the final authority on thorny problems. Winner Manitoba Telephone System scholarship and City Hydro work scholarship. Active skier. Bright future.

LEONARD E. PETRIE

Activities: bowling, basketball. Happy fellow, with realistic approach. Future includes a Master's degree and early marriage.

OREST Z. ROY

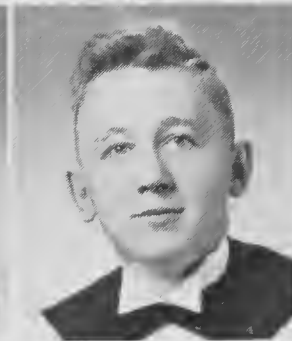
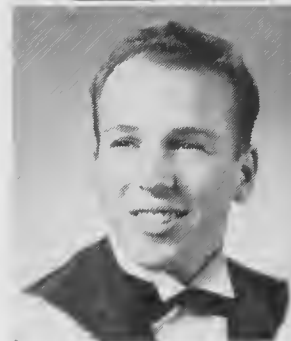
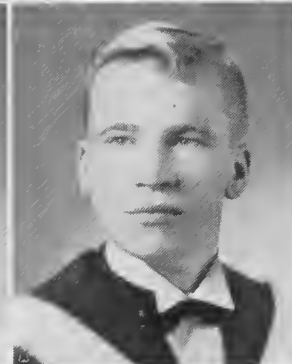
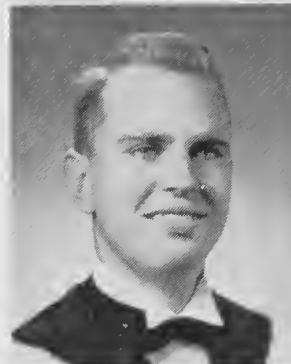
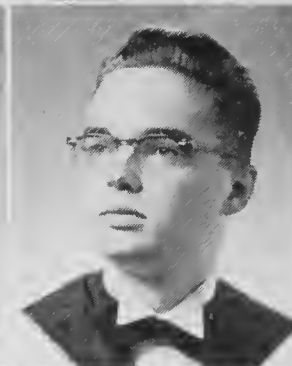
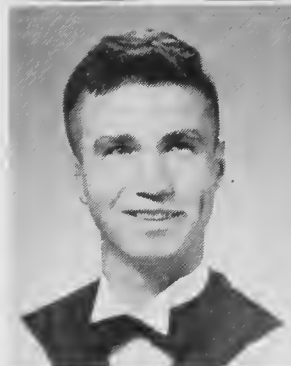
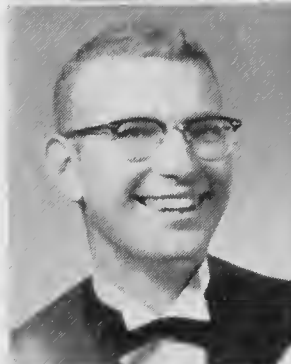
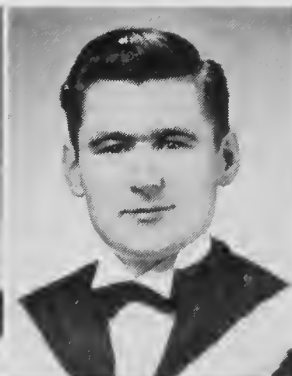
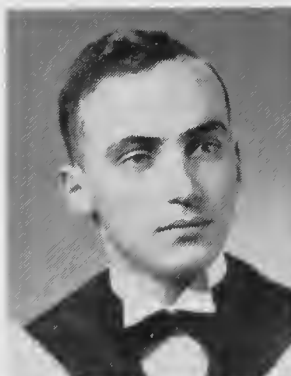
An alumnist of Isaac Newton High School, who has held the Griffiths, Gyles Memorial, and Isbister Scholarships. His interests are in music and furthering the cause of the accordion.

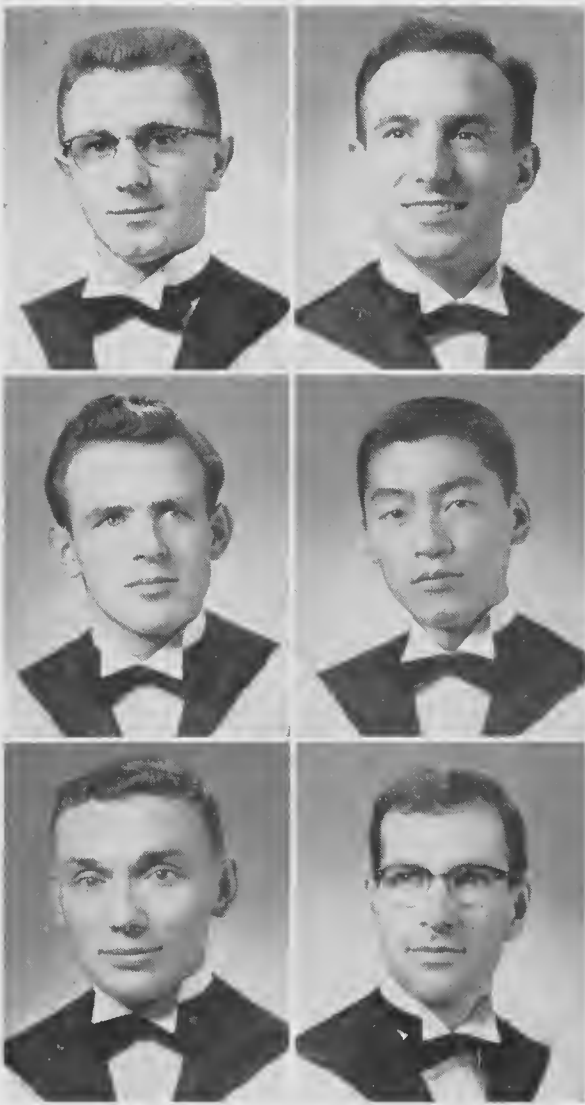
BERNARD G. SHUKSTER

Middle name Versatile—nickname Casual. Has successfully wooed and won, dribbled and sank, bid and passed. Casual in his approach, let's Atlas shoulder the world. A local man who intends to move his yardsticks. Prognosis: no ulcers and fair degree of success.

RAYMOND D. SWEENEY

Local St. Paul boy, editor of University Telephone Directory (1954-5), curling (2, 3, 4), bowling (2, 3). Member of Newman Club. Future in power generation and distribution with Alcan, Quebec.





Electrical Graduates

WILHELM J. TISCHINSKI

Likable fellow from Roblin. Soccer (2, 3, 4), rifle (3), basketball (2). Member Canadian Polish Athletic Club and membership chairman of Newman Club. Holder of the City Hydro work scholarship 1955. Interested also in photography and baseball. Future in power engineering.

DAVID WISEMAN

The only Shakespearean actor in fourth year. Also soccer, curling, swimming, and lately hockey with Engineering's A.K.'s. Vice-president Rifle Club. Oldest eligible bachelor in class. Future: guiding missiles.

MILTON ZINK

Big, elegant gentleman, sportsman, scholar with musical inclinations. Gregarious, likable. Summer experience with pipelines and oil operations. Future to begin with training in Cleveland. Great success predicted.

ROBERT N. AYUKAWA

From Toronto. Activities: curling (3, 4), fishing, golf and checkers. Experience with National Research Council. Future in geophysics.

HARRY KOWALIK

Activities: class representative (2, 3). California Standard Undergraduate Scholarship (1955). Outside activities are baseball, golf, curling, swimming. Future in servomechanisms.

KENNETH SODOMSKY

Activities include Engineering Debating Chairman, Hillel Foundation, Sigma Alpha Mu, chess, music and reading. Isbister Scholarship and Athlone Fellowship (1956-8). Has a mind characterized by inquisitiveness, logic and moderation, and devotion to knowledge. Post-graduate work in England, ultimately leading to research or allied work.

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The University of Manitoba

*on the recommendation of the Senate
has conferred on the following students
who have completed the prescribed course of study and have
passed the required examinations
the Degree of*

Bachelor of Science in Geological Engineering

with all the rights and privileges thereto appertaining.



Geological Graduates

CLIFFORD R. CHANT

During his four years in Engineering, Cliff has participated regularly in inter-faculty soccer, curling and the rifle club. He is also a member of good standing in the Geology Club. He calls McGregor, Manitoba, his home. Future: Oil business.

RONALD F. EMSLIE

Member of the Geology Club and the Canadian Institute of Mining and Metallurgy. Also a staunch government man—three summers with the Geological Survey of Canada. Future: More education.

ROBERT GAIR

The man of many sports—volleyball, handball, badminton to name a few. A member of the Geology Club, C.I.M.M., S.E.I.C., and the Delta Upsilon Fraternity. Future: Bushman.

J. NORMAN HOUCK

The class wit from St. James, and one of the better curlers at the University with a varsity bonspiel win ('54) and a tie in grand aggregate of the Manitoba Bonspiel in '55 (even if he was a fizzle this year). Supports the Geology Club and the C.I.M.M. Future: Hardrock Geologist.

JOHN M. MOORE

One of the youngest graduates this year and, in addition, one of the brightest. John participated in inter-fac basketball '52-'53, rifle club, was social chairman for the Engineering Council in '54-'55, and "Manitoban" rep. '55-'56, member of U of M Jazz Society '55-'56. In addition to this, John is a member of Delta Kappa Epsilon Fraternity, participated in several pep rallies and Varsity Varities 1956, and is an active member in the Geology Club and the C.I.M.M. As an award for his endeavours, John received the E.I.C. Prize for '55-'56, plus the Mobiloil Scholarship. This boy never misses a bet. Future: More education.

WOLODYMYR PAPIRCHUK

Born in the Ukraine, Walter came to Canada in 1940. He has been president of the Ukrainian U. Students' Society, held a Society Scholarship in '54-'55. Member of the Gamma Rho Kappa, Geology Club and the C.I.M.M. Interests: Photograph, hunting, music. A quiet, efficient, likable guy who will go places. Future: Geophysical exploration for oil.

GARY L. PEAKER

From Riverton, Manitoba, another top-notch curler—member of the rink representing Manitoba in the Inter-varsity playdowns in '54. Held a Manitoba Brewers and Hotelkeepers Scholarship in '52-'53 and '53-'54. A member of the Geology Club, C.I.M.M. Future: Oil business.

RONALD T. PEIRCE

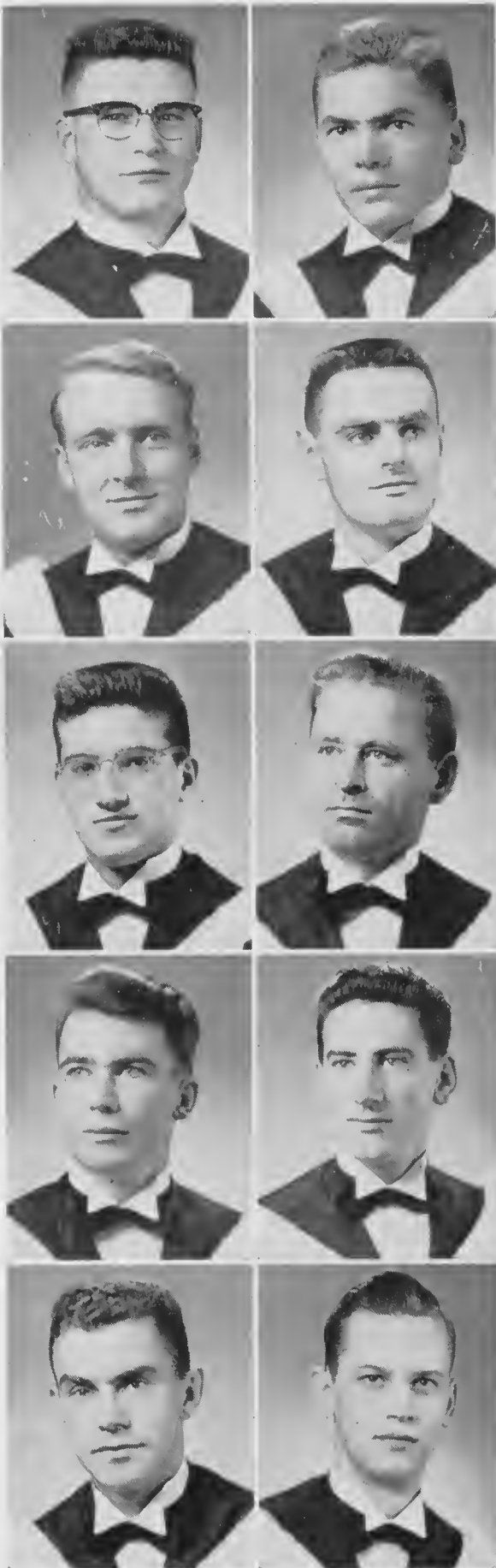
Sports—A mainstay of the Varsity Ski Club; won the Manitoba Open Slalom this winter. Ron is a member of the Geology Club and the C.I.M.M. also. Future: Geologist or Ski Bum.

EDWARD PETRIE

Ted is a member of the Geology Club, the C.I.M.M. and the S.E.I.C. Has spent the past two summers up north in the search for oil. Future: Oil business.

JAMES M. STANBRIDGE

Jim is a faculty curler, member of the Geology Club, C.I.M.M., the S.E.I.C. A disappointing class representative in the famous 40 beer contest. A veteran of two summers at Flin Flon. Future: One of the hardrock minority.

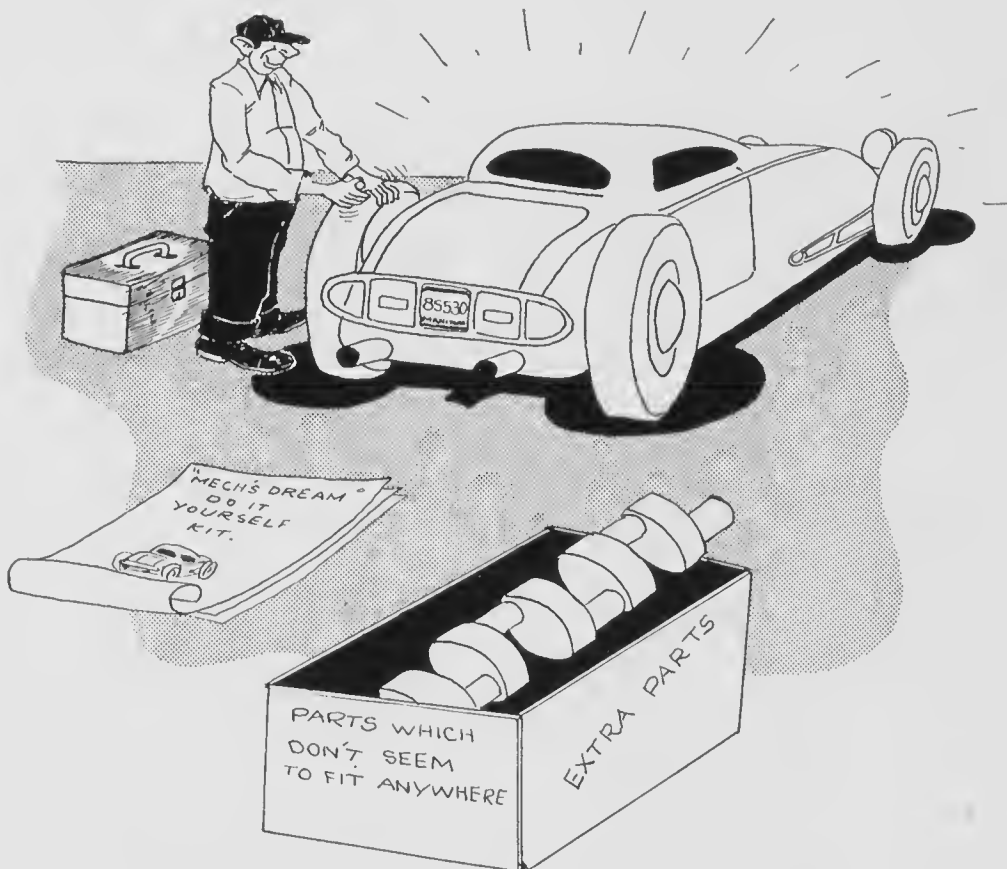


The University of Manitoba

*on the recommendation of the Senate
has conferred on the following students
who have completed the prescribed course of study and have
passed the required examinations
the Degree of*

Bachelor of Science in Mechanical Engineering

with all the rights and privileges thereto appertaining.



Mechanical Graduates

PETER M. ABEL

Pete graduated from Commerce (Honours) in 1950 and worked as a "spy" for the government before entering Engineering. Has won several scholarships during his four years. Active in debating, pep rallies, skits, and has held several student positions, such as Editor of "Slide Rule" in 4th year, associate editor and business manager of "Brown & Gold" in 3rd year. He is an avid model railroader and takes an interest in motion picture photography.

RALPH C. ADDISON

Another top student, Ralph plays almost all sports, enjoys golf, basketball and swimming the most. An active member of the Phi Delta Theta Fraternity. Favourite pastime: Coffee in the Caf discussing sports cars. Ralph plans to start his career with Union Carbide of Canada in Buffalo, New York.

G. HOWARD AGNEW

Born and attended both public and high schools in St. James. Took Science I and II at United College. Married in 1954. A navy man, his main interests are fishing and hunting. Plans to spend his future drilling oil wells for Texaco.

ROBERT A. BEDDOME

A self-styled "plain old country boy" hailing from Gimli. Bob is one of the "brighter" students in the class and collected three scholarships during his Engineering Course. Plans on working for Linde Air Products after graduation.

LEONARD BERMAN

"Cheech" came to the University of Manitoba from St. John's Tech. An active participant in both the Pembina and Pioneer Athletic Clubs and a member of the S.A.E. He hopes to end up working in a region where the climate is considerably warmer.

GERALD H. CHYMKO

Gerry attended High School in Biggar, Saskatchewan, before coming to Manitoba. He actively participates in soccer, tennis, volleyball and hockey. Main interests after graduation are matrimony and a career with Ontario Hydro, in that order.

RICHARD J. CONNER

A graduate of Kelvin High School, who spent a year at United College before taking Engineering. Is active in curling, golf, volleyball, and is a member of Delta Upsilon Fraternity. Top notch ticket salesman for Bison home games and a member of the Pioneer Athletic Club.

DIEDRICH G. DUECK

A product of Altona, Manitoba, and is a graduate of Gretna Mennonite Collegiate Institute. Participates in hockey, tumbling, volleyball, archery and the rifle club. Diedrich is also a member of the Inter-Varsity Christian Fellowship. Plans for a career in maintenance or production work.

THOMAS H. FERENS

Tom played six-man football and is a reserve officer in the Royal Canadian Navy. He hopes to enter the field of Power Engineering and leave "Eskimo Land" as he likes to call Winnipeg.

C. R. FERRIS

Roly comes from Wawanesa, Manitoba. Took part in hockey, soccer, volleyball and rifle shooting. Had trouble trying to hand his labs in on time as well as keep in good physical condition. Future plans include Canadian Chemicals.



Mechanical Graduates

TREVOR C. FRASER

Actively participates in golf, volleyball and basketball. A reserve officer in the R.C.A.F., and hopes to work in the aircraft industry after graduation. Member of the Fraternal Order of the Hawks, three-man football squad, and lately a member of the Pembina Club. Spends lunch hours as the "better half" of a potent bridge combination.

JOHNNIE W. GATSCHUFF

Johnnie participated in soccer, volleyball, basketball and was a member of the rifle club. Hobbies include camping and hunting. "Gat" was formerly of the Cambridge Club, but is now a regular patron of the Pembina and the Pioneer Athletic Clubs. Hopes to see "Gib" the morning after the night before.

DONALD S. GIBBONS

Participates in curling and soccer on campus and golf in spare time. Will graduate from Pembina (Old Cambridge) Club this year, and will head for Hamilton to work for the Canadian Westinghouse Corporation. Plans to get married this May and have several little engineers in due course.

ROBERT S. HAYWARD

Another one of the married boys in the class. Plays soccer and hockey and is a member of Kappa Pi Fraternity. This boy should have a good future as an able Sales Engineer for some deserving company.

JACK O. KLEIN

"Jake" came to "U" from St. John's High School. Plays basketball and volleyball, and does sketches and oil paintings in his spare time. A member of good standing in the Pioneer Athletic and Pembina Clubs. Plans to work as an industrial engineer.

BILL LEGIEC

Bill is a real traveller, having lived in about seventeen different countries. Born in Poland, he started high school in Palestine and finished in England. Came to Canada in 1952 and is now married. Active in volleyball, soccer, swimming, track and field.

PAUL LEUNG

Comes from Hong Kong. Paul is a member of the Inter-Varsity Christian Fellowship and the International Students' Organization. Participates in tennis and swimming. Feels he has finally learned to understand "slang," which he found more difficult than the language used by the professors.

KENNETH LINN MACDONALD

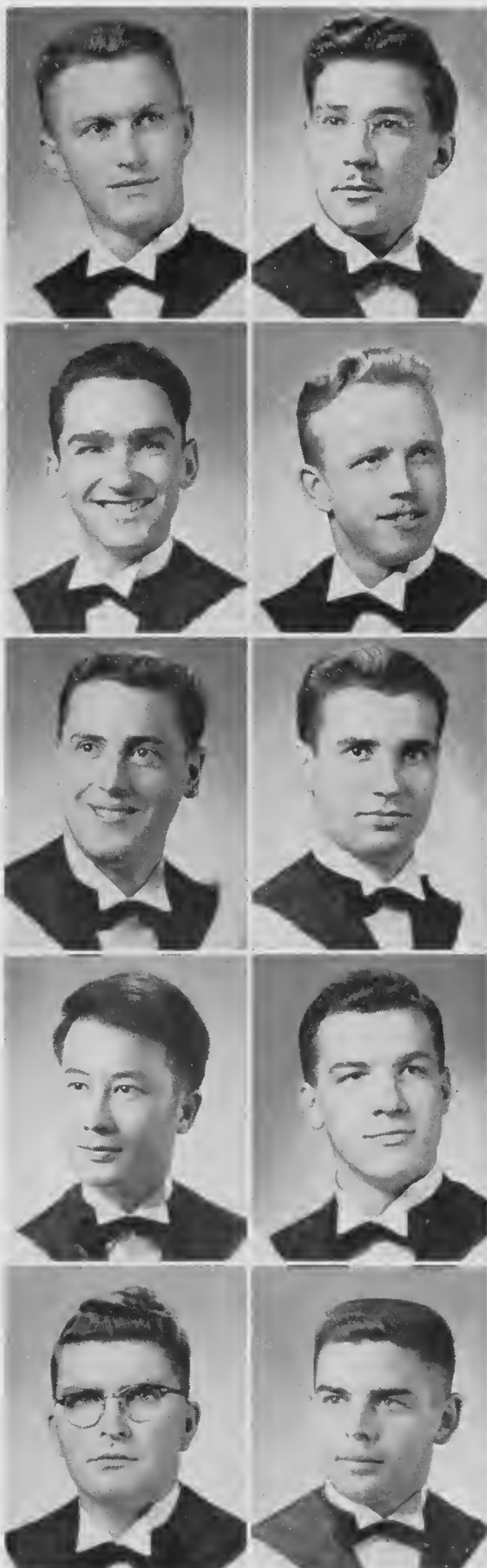
Hometown: Fort Saskatchewan, Alberta. Near top of class all through Engineering and has several scholarships to his credit. A rugged participant in inter-faculty sports, Linn seems to find more time than most to visit the Pembina Club and enjoy a lively residence life.

WILLIAM R. MARTIN

Bill is active in both curling and golf and is a staunch supporter of the Pioneer Athletic Club. Still a bachelor, but says he can hear the bells. Feels that twenty-two years in the West is too long and is heading for Buffalo and a future with Linde Air Products.

DOUGLAS G. MCKENZIE

Active in basketball, volleyball and hockey. A member of the winless Fraternal Order of the Eagles, three-man football team, and the other half of the "potent" bridge combination. A member of the Pembina Club and the Norwood Club; is undecided as to his future.



Mechanical Graduates

YUKIO OKAMURA

"Duke" was born in Kennedy, B.C., but hopes to remain in Winnipeg after graduation. Takes part in softball, bowling and lacrosse. He stands to receive the sum of one dollar from Len Morhalo if he can stay single until June, 1957. Keeper of the books of the Pembina Club.

LEO L. PAQUIN

Chairman of the S.E.I.C. and a member of the Engineering Student Council. Leo is interested in gas turbines and is planning his future accordingly. Likes to tinker with his car when he isn't changing the diapers of his son, Denis.

EDWARD POLLOCK

Ed came to U of M via Daniel Mac High School. A member of good standing of the Pembina and Pioncer Athletic Clubs, and a member of Sigma Lambda Phi Fraternity. Also a member of the Fraternal Order of the Hawks. Participated in hockey, volleyball and basketball while at U. He wants to remain "one of the boys," so is looking for a wife. Future includes Imperial Oil.

NEIL RICHARDS

Comes from Port Arthur, Ontario, and is a graduate in first-year applied science at the Lakehead Technical Institute. He is a member of the central Y.M.C.A. in Winnipeg and was active in basketball, soccer, badminton, gymnastics and the rifle club at University.

J. NORMAN RIDDLE

Was active in volleyball and curling and spent a year on the Engineering Council. Norm is a member of the Sigma Phi Delta Fraternity, Order of the Black Square, and works with the Greater Winnipeg Boys' Club. Plans on working for Canadian Chemical Co. in Edmonton after graduation.

HARRY ROSTIG

Harry comes from Berlin, Germany. His specialty is Refrigeration Engineering. As co-chairman of the University Glee Club and member of other musical organizations, he devotes his spare time to the advancement of music. He is also an enthusiastic chess player and photographer.

HENRY J. SCHLEIER

Henry is an active member of the CAI, Glee club, and is an officer in the RCN(R). He is also a keen curling supporter. Expects to do his engineering in Montreal after graduation.

DAVID A. SHEARER

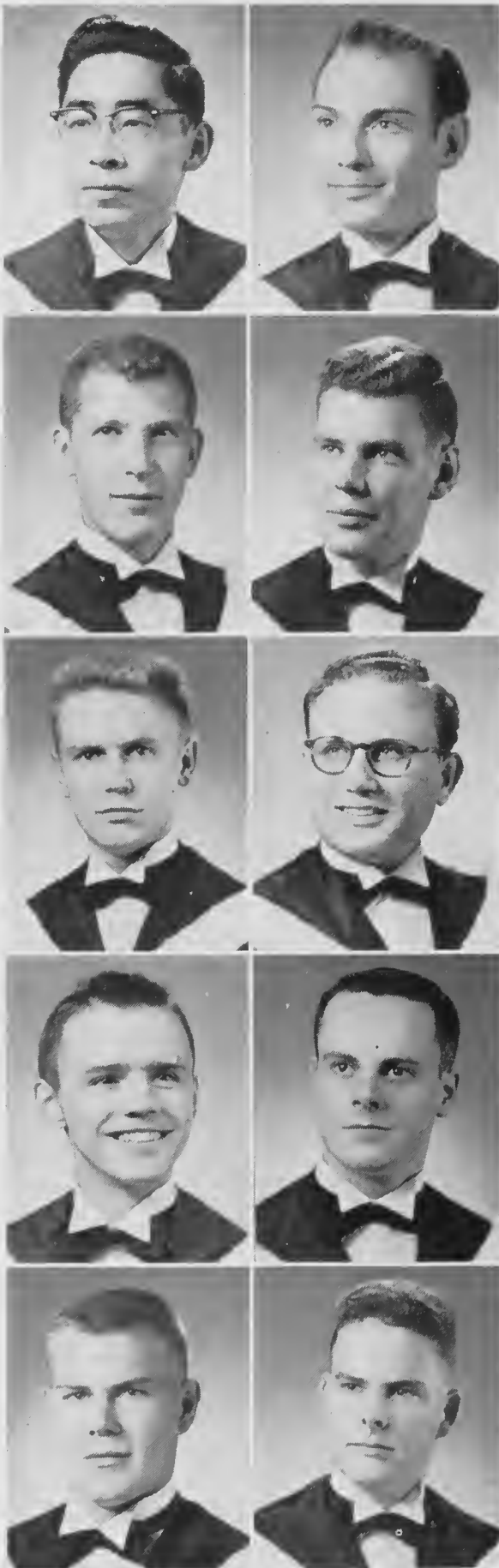
Dave is one of the "old" married men in the class (spring 1955). Intends working for Bailey Meter after graduation. A union musician and a member of the EIC and ASM, his hobbies include reading. He claims his greatest achievement so far is learning to whistle through his nose; main ambition is to get out of University.

DENNIS B. SIGURDSON

Participated in hockey, volleyball and football. A member of the Phi Kappa Pi Fraternity and the Fraternal Order of the Hawks. Plans to retire after making his first million.

JOSEPH D. SOMERS

Has been active in Young People's Club and is a member of the Order of the Black Square and a charter member of the Sigma Phi Delta Fraternity. He also received a commission from UNTD. Participated in soccer and hockey on campus.



Mechanical Graduates

W. WAYNE STARR

Participates in hockey, volleyball and football. Another member of the hapless Fraternal Order of the Eagles. Wayne plans on a future in the air-conditioning field. When T.V. gets a wider screen, he plans to take over from Jackie Gleason. Expects to be married in the near future.

STANLEY P. S. SULYMKA

Stan hails from Newdale, Manitoba, and attended high school in Yorkton, Saskatchewan. Active in curling and hockey and a member of the "Residence Friday Night Pembina Club." Plans on a future in design or maintenance.

KAS SWIDERSKI

Born in Poland, and graduated from high school in England. Active in volleyball and soccer and has music and dancing as a hobby. Legiec's partner in crime and the only one known to eat his pepperoni with ecstasy.

J. REGINALD TANSONY

Reg. is interested in curling, shooting, and Pioneer Athletic Club activities. Past President of the Varsity Rifle Club. Hobbies include model airplane building and working on cars. Married in Fall of 1955. Reg plans on working for P. & G. in Hamilton.

GARY R. THOMPSON

Married man, the father of a six-months-old girl. This year's athletic chairman of Engineering, chairman of the Men's Intramural Council, member of the Athletic Directorate and a member of the Sigma Lambda Phi Fraternity. Athletic interests lie in rugby, hockey, track, volleyball, soccer, and lacrosse. Hopes to take business administration and later see the world. A member of the Fraternal Order of the Eagles.

ROBERT G. THOMPSON

Bob is a graduate of the Royal Military College in Kingston, and returned home to Winnipeg this year to finish school. Active in volleyball and curling. Bob is married and at present is in the R.C.A.F. Says his future is undecided.

RICHARD C. VERNER

On the six-year plan. President of the Pembina Club and last surviving member of the original Cambridge Club. "Rich" is also a member of the Fraternal Order of Hawks. He was on the Engineering Council for '50 and '52 and participated in volleyball, basketball and hockey. Member of Sigma Lambda Phi Fraternity.

PAUL C. WHITE

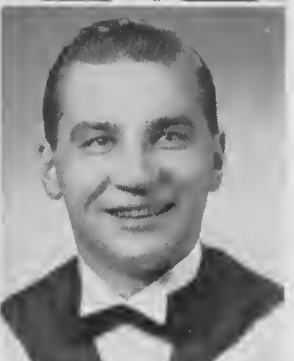
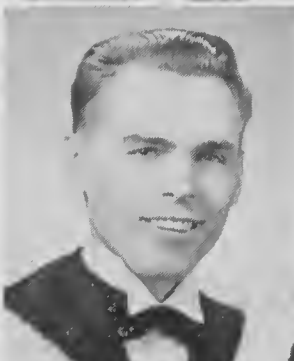
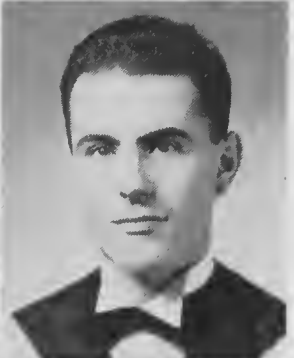
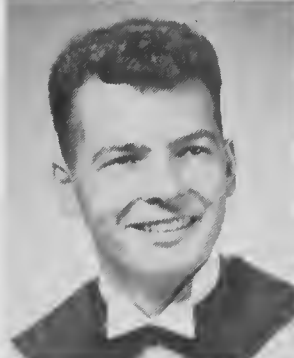
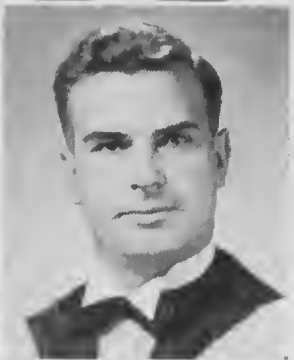
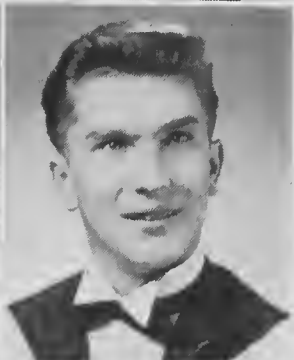
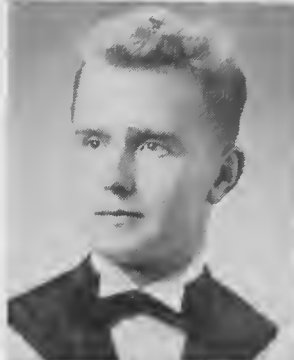
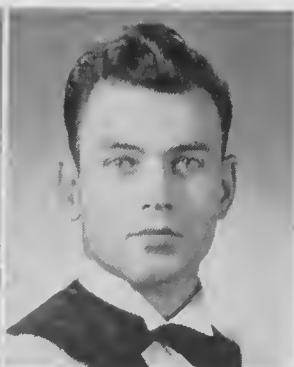
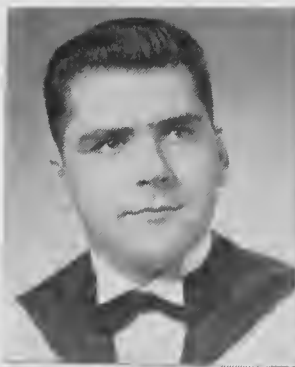
Participates in curling, handball, golf and volleyball. Treasurer of the Engineering Council and member of Delta Upsilon Fraternity and the Y.M.C.A. Also member of Glec Club and Pioneer Athletic Club.

CHESTER ZEGLINSKI

When he wasn't looking for his cap (locks aren't much good, Chester), this fellow was organizing assistance to get his car (have it your way, but it's still an English road-block) out of the strangest places. (Residence Lounge.) Future undecided as yet.

LEN MORHALO

Besides trying to pass the course, Len is a participant on the Engineers' swimming team and a member of the rifle club. Enjoys the Friday meetings of the Pembina Club. Spends his spare time shooting ducks and snapping pictures. Will be married in May, and hopes to raise a large family in sets of twins.

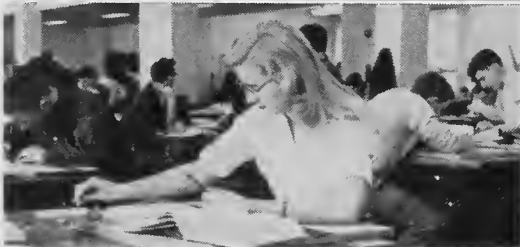


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*Old stonies
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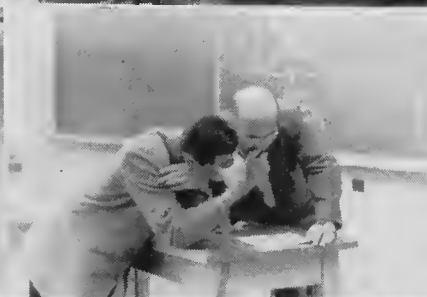
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*Challenging
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bridge
combination*

*I'll flip
you for
coffee.*



*The
students'
interests
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*Henry
pays.*



*Picture of
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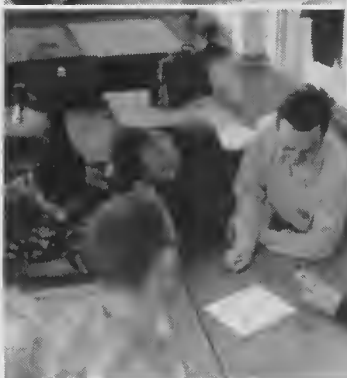
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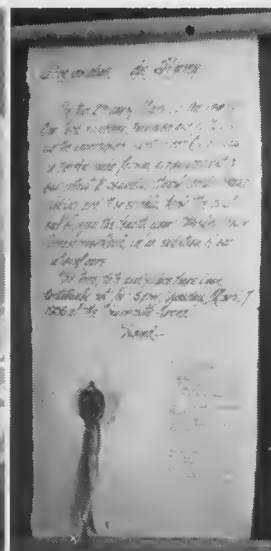
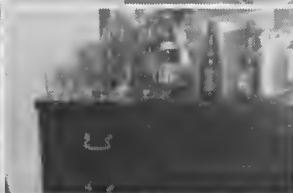
*Listening
to one of
the more
interesting
lectures.*



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*The
Civils
challenged,
the
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*Oscar shows the boys
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*Regular meeting of the
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*Homeward bound after
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*The boys show Oscar
how it happened.*

*Engineers' opinion of the
Manitoban . . . con-
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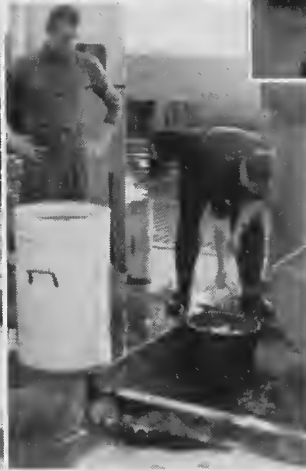
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Second bride: "I don't know. We've only been married three days."

* * *

"Some women say they could have married anyone they pleased. Maybe they never pleased anyone."

* * *

"I know a place where women never wear anything but a string of pearls."

"Where?"

"Around their necks."

* * *

A bachelor is a man who has been lucky in love.

* * *

And then there's the one about the man who hurried up to the counter, laid down two nickels, and demanded a can-opener. The clerk handed him a dime, and the man went happily on his way.

"I always wash my hair in beer."

"Does that help?"

"No, but I've got the happiest dandruff in town."

* * *

A snuff manufacturer is a man who goes around putting his business in other people's noses.

* * *

Pledge: "If your so crazy about the guy, why don't you marry him?"

Sister: "Do you think I want to hook up with a guy who snores all night?"

* * *

Exasperated with his behaviour the young girl snapped at her date:

"Don't you know what good clean fun is?"

"No," he replied, "what good is it?"

* * *

Then there was a girl who soaked her strapless evening gown in coffee so it would stay up all night.

* * *

A girl standing on the street corner and wearing a low cut V-neck sweater was approached by a wolf.

"Is that V for victory?" he asked.

"No, that's for virtue," she answered, "but it's an old sweater."

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Newlywed on honeymoon in wire to boss:
"Please extend vacation. It's wonderful here."

His boss wired back: "It's wonderful anywhere. Get back to the office."

* * *

My gal reminds me of a switchboard, because when she walks, all her lines are busy.

* * *

The old man was more than a little irritated when he called his boys in and demanded to know who had pushed the privy into the river.

"I did, father," spoke up one lad.

"Come out in the woodshed," the old man ordered. "I'm going to whale the daylight out of you."

"George Washington's father didn't punish him when he told the truth," pleaded the boy.

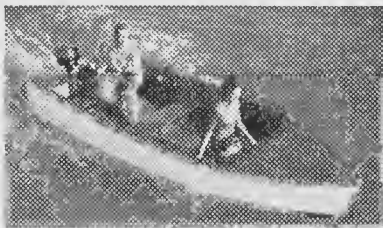
"Yes, I know," replied the old man, "but George Washington's father wasn't sitting in the cherry tree."

* * *

Rushing to the hospital in a frantic race with the stork one day, the mother-to-be didn't quite make it and the baby was born on the hospital lawn.

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A couple of days later he received the corrected bill which read, "Green Fees \$35.00."

* * *

A stately old gentleman was walking along the riverbank when he came upon a little boy who stared out onto the water, a fishing pole in his hand.

"What are you doing, young man?"

"Drowning worms," was the retort.

* * *

One of the boys who was more than down on his luck, in fact was a bum, knocked on the back door of a fashionable home on the crescent. The lady of the house opened the door and our friend whined:

"Please, ma'm, I haven't eaten in two weeks."

The lady exclaimed: "Oh but you should force yourself!"

* * *

There was a factory in Russia which was producing a highly secret commodity and there was a triple guard at every exit. Every night a workman would appear at one of the gates with a wheelbarrow full of straw. Of course the guards went through the straw every time but they could find nothing in the straw. Once they even had the straw analyzed for any chemical, but with no luck. Eventually the workman became wealthy and he was "ret" one day by one of the guards.

"Just between you and me," said the guard, "what are you smuggling out?"

"Wholes," replied the former workman.

* * *

There was a young man from France
Who waited ten years for the chance.
He muffed it.

* * *

Traveller: "Quick, give me a round-trip ticket!"

Clerk: "Where to?"

Traveller: "Back here, you fool!"

* * *

Drunk in a telephone booth: "Number hell—I want my peanuts!"

* * *

Minister (playfully pinching little boy's knee): "And who has nice chubby legs?"

Little boy: "Betty Grable."

* * *

A civil met a sweet young thing at a party and, after the proper introductions, the young man asked her: "Do you dance?"

"I love to," she answered.

"Okay," said the civil, "Then let's love."



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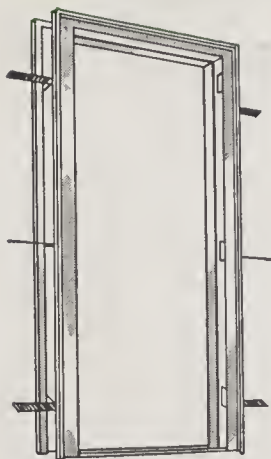


Assisting the Editor and his associates in the preparation of the College annual is one of the happiest assignments which come to us. We appreciate the opportunity of participating in the publication of this one to the extent of providing the printing plates.



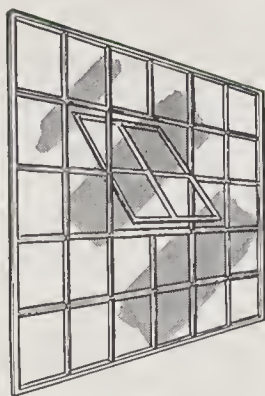
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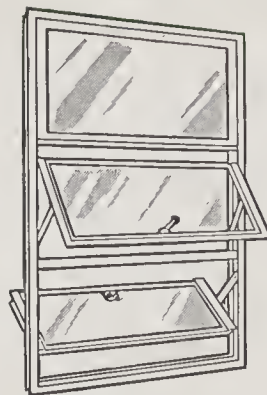
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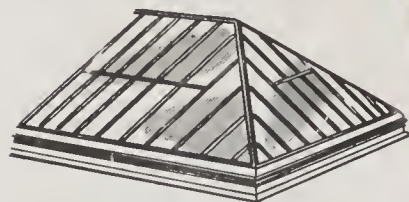
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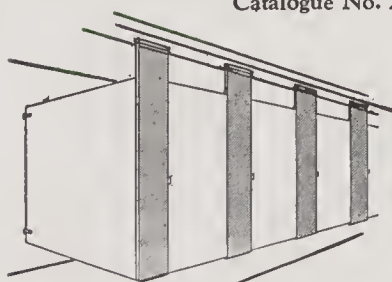


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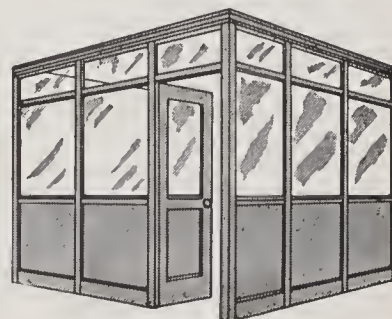


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